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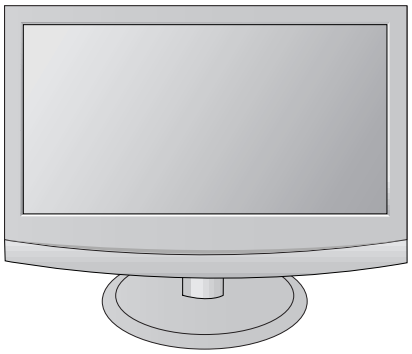
LCD MONITOR TV
SERVICE MANUAL

CHASSIS : LD84J

MODEL : M237WD M237WD-PMJ

CAUTION
BEFORE SERVICING THE CHASSIS,
READ THE SAFETY PRECAUTIONS IN THIS MANUAL.



CONTENTS

CONTENTS 2

PRECAUTIONS 3

SPECIFICATION 6

ADJUSTMENT INSTRUCTION 12

TROUBLE SHOOTING 15

BLOCK DIAGRAM.....24

DESCRIPION OF BLOCK DIAGRAM 25

EXPLODED VIEW 26

SVC. SHEET .....

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SAFETY PRECAUTIONS

IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by ⚠ in the Schematic Diagram and Exploded View.
It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent Shock, Fire, or other Hazards.
Do not modify the original design without permission of manufacturer.

General Guidance

An **isolation Transformer should always be used** during the servicing of a receiver whose chassis is not isolated from the AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks.

It will also protect the receiver and it's components from being damaged by accidental shorts of the circuitry that may be inadvertently introduced during the service operation.

If any fuse (or Fusible Resistor) in this TV receiver is blown, replace it with the specified.

When replacing a high wattage resistor (Oxide Metal Film Resistor, over 1W), keep the resistor 10mm away from PCB.

Keep wires away from high voltage or high temperature parts.

Before returning the receiver to the customer,

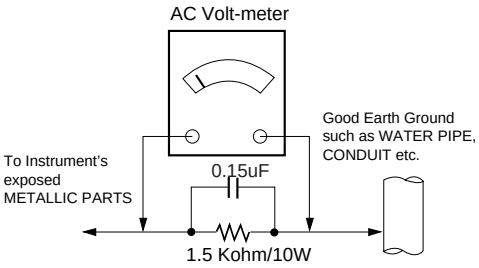
always perform an **AC leakage current check** on the exposed metallic parts of the cabinet, such as antennas, terminals, etc., to be sure the set is safe to operate without damage of electrical shock.

Leakage Current Cold Check(Antenna Cold Check)
With the instrument AC plug removed from AC source, connect an electrical jumper across the two AC plug prongs. Place the AC switch in the on position, connect one lead of ohm-meter to the AC plug prongs tied together and touch other ohm-meter lead in turn to each exposed metallic parts such as antenna terminals, phone jacks, etc.
If the exposed metallic part has a return path to the chassis, the measured resistance should be between 1MΩ and 5.2MΩ.
When the exposed metal has no return path to the chassis the reading must be infinite.
An other abnormality exists that must be corrected before the receiver is returned to the customer.

Leakage Current Hot Check (See below Figure)
Plug the AC cord directly into the AC outlet.

Do not use a line Isolation Transformer during this check.
Connect 1.5K/10watt resistor in parallel with a 0.15uF capacitor between a known good earth ground (Water Pipe, Conduit, etc.) and the exposed metallic parts.
Measure the AC voltage across the resistor using AC voltmeter with 1000 ohms/volt or more sensitivity.
Reverse plug the AC cord into the AC outlet and repeat AC voltage measurements for each exposed metallic part. Any voltage measured must not exceed 0.75 volt RMS which is corresponds to 0.5mA.
In case any measurement is out of the limits specified, there is possibility of shock hazard and the set must be checked and repaired before it is returned to the customer.

Leakage Current Hot Check circuit



When 25A is impressed between Earth and 2nd Ground for 1 second, Resistance must be less than 0.1 Ω
*Base on Adjustment standard

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SERVICING PRECAUTIONS

CAUTION: Before servicing receivers covered by this service manual and its supplements and addenda, read and follow the *SAFETY PRECAUTIONS* on page 3 of this publication.
NOTE: If unforeseen circumstances create conflict between the following servicing precautions and any of the safety precautions on page 3 of this publication, always follow the safety precautions. Remember: Safety First.

General Servicing Precautions

1. Always unplug the receiver AC power cord from the AC power source before;
   a. Removing or reinstalling any component, circuit board module or any other receiver assembly.
   b. Disconnecting or reconnecting any receiver electrical plug or other electrical connection.
   c. Connecting a test substitute in parallel with an electrolytic capacitor in the receiver.
   CAUTION: A wrong part substitution or incorrect polarity installation of electrolytic capacitors may result in an explosion hazard.

2. Test high voltage only by measuring it with an appropriate high voltage meter or other voltage measuring device (DVM, FETVOM, etc) equipped with a suitable high voltage probe.
   Do not test high voltage by "drawing an arc".
3. Do not spray chemicals on or near this receiver or any of its assemblies.
4. Unless specified otherwise in this service manual, clean electrical contacts only by applying the following mixture to the contacts with a pipe cleaner, cotton-tipped stick or comparable non-abrasive applicator; 10% (by volume) Acetone and 90% (by volume) isopropyl alcohol (90%-99% strength)
   CAUTION: This is a flammable mixture.
   Unless specified otherwise in this service manual, lubrication of contacts in not required.
5. Do not defeat any plug/socket B+ voltage interlocks with which receivers covered by this service manual might be equipped.
6. Do not apply AC power to this instrument and/or any of its electrical assemblies unless all solid-state device heat sinks are correctly installed.
7. Always connect the test receiver ground lead to the receiver chassis ground before connecting the test receiver positive lead.
   Always remove the test receiver ground lead last.
8. *Use with this receiver only the test fixtures specified in this service manual.*
   CAUTION: Do not connect the test fixture ground strap to any heat sink in this receiver.

Electrostatically Sensitive (ES) Devices

Some semiconductor (solid-state) devices can be damaged easily by static electricity. Such components commonly are called *Electrostatically Sensitive (ES) Devices.* Examples of typical ES devices are integrated circuits and some field-effect transistors and semiconductor "chip" components. The following techniques should be used to help reduce the incidence of component damage caused by static by static electricity.

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed to prevent potential shock reasons prior to applying power to the unit under test.
2. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
3. Use only a grounded-tip soldering iron to solder or unsolder ES devices.
4. Use only an anti-static type solder removal device. Some solder removal devices not classified as "anti-static" can generate electrical charges sufficient to damage ES devices.
5. Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ES devices.
6. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it. (Most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive material).
7. Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed.
   CAUTION: Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.
8. Minimize bodily motions when handling unpackaged replacement ES devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ES device.)

General Soldering Guidelines

1. Use a grounded-tip, low-wattage soldering iron and appropriate tip size and shape that will maintain tip temperature within the range or 500ºF to 600ºF.
2. Use an appropriate gauge of RMA resin-core solder composed of 60 parts tin/40 parts lead.
3. Keep the soldering iron tip clean and well tinned.
4. Thoroughly clean the surfaces to be soldered. Use a mall wire-bristle (0.5 inch, or 1.25cm) brush with a metal handle.
   Do not use freon-propelled spray-on cleaners.
5. Use the following unsoldering technique
   a. Allow the soldering iron tip to reach normal temperature. (500ºF to 600ºF)
   b. Heat the component lead until the solder melts.
   c. Quickly draw the melted solder with an anti-static, suction-type solder removal device or with solder braid.
   CAUTION: Work quickly to avoid overheating the circuit board printed foil.
6. Use the following soldering technique.
   a. Allow the soldering iron tip to reach a normal temperature (500ºF to 600ºF)
   b. First, hold the soldering iron tip and solder the strand against the component lead until the solder melts.
   c. Quickly move the soldering iron tip to the junction of the component lead and the printed circuit foil, and hold it there only until the solder flows onto and around both the component lead and the foil.
   CAUTION: Work quickly to avoid overheating the circuit board printed foil.
   d. Closely inspect the solder area and remove any excess or splashed solder with a small wire-bristle brush.

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IC Remove/Replacement

Some chassis circuit boards have slotted holes (oblong) through which the IC leads are inserted and then bent flat against the circuit foil. When holes are the slotted type, the following technique should be used to remove and replace the IC. When working with boards using the familiar round hole, use the standard technique as outlined in paragraphs 5 and 6 above.

Removal

1. Desolder and straighten each IC lead in one operation by gently prying up on the lead with the soldering iron tip as the solder melts.
2. Draw away the melted solder with an anti-static suction-type solder removal device (or with solder braid) before removing the IC.

Replacement

1. Carefully insert the replacement IC in the circuit board.
2. Carefully bend each IC lead against the circuit foil pad and solder it.
3. Clean the soldered areas with a small wire-bristle brush. (It is not necessary to reapply acrylic coating to the areas).

"Small-Signal" Discrete Transistor Removal/Replacement

1. Remove the defective transistor by clipping its leads as close as possible to the component body.
2. Bend into a "U" shape the end of each of three leads remaining on the circuit board.
3. Bend into a "U" shape the replacement transistor leads.
4. Connect the replacement transistor leads to the corresponding leads extending from the circuit board and crimp the "U" with long nose pliers to insure metal to metal contact then solder each connection.

Power Output, Transistor Device Removal/Replacement

1. Heat and remove all solder from around the transistor leads.
2. Remove the heat sink mounting screw (if so equipped).
3. Carefully remove the transistor from the heat sink of the circuit board.
4. Insert new transistor in the circuit board.
5. Solder each transistor lead, and clip off excess lead.
6. Replace heat sink.

Diode Removal/Replacement

1. Remove defective diode by clipping its leads as close as possible to diode body.
2. Bend the two remaining leads perpendicular y to the circuit board.
3. Observing diode polarity, wrap each lead of the new diode around the corresponding lead on the circuit board.
4. Securely crimp each connection and solder it.
5. Inspect (on the circuit board copper side) the solder joints of the two "original" leads. If they are not shiny, reheat them and if necessary, apply additional solder.

Fuse and Conventional Resistor Removal/Replacement

1. Clip each fuse or resistor lead at top of the circuit board hollow stake.
2. Securely crimp the leads of replacement component around notch at stake top.
3. Solder the connections.
   CAUTION: Maintain original spacing between the replaced component and adjacent components and the circuit board to prevent excessive component temperatures.

Circuit Board Foil Repair

Excessive heat applied to the copper foil of any printed circuit board will weaken the adhesive that bonds the foil to the circuit board causing the foil to separate from or "lift-off" the board. The following guidelines and procedures should be followed whenever this condition is encountered.

At IC Connections

To repair a defective copper pattern at IC connections use the following procedure to install a jumper wire on the copper pattern side of the circuit board. (Use this technique only on IC connections).

1. Carefully remove the damaged copper pattern with a sharp knife. (Remove only as much copper as absolutely necessary).
2. carefully scratch away the solder resist and acrylic coating (if used) from the end of the remaining copper pattern.
3. Bend a small "U" in one end of a small gauge jumper wire and carefully crimp it around the IC pin. Solder the IC connection.
4. Route the jumper wire along the path of the out-away copper pattern and let it overlap the previously scraped end of the good copper pattern. Solder the overlapped area and clip off any excess jumper wire.

At Other Connections

Use the following technique to repair the defective copper pattern at connections other than IC Pins. This technique involves the installation of a jumper wire on the component side of the circuit board.

1. Remove the defective copper pattern with a sharp knife. Remove at least 1/4 inch of copper, to ensure that a hazardous condition will not exist if the jumper wire opens.
2. Trace along the copper pattern from both sides of the pattern break and locate the nearest component that is directly connected to the affected copper pattern.
3. Connect insulated 20-gauge jumper wire from the lead of the nearest component on one side of the pattern break to the lead of the nearest component on the other side. Carefully crimp and solder the connections.
   CAUTION: Be sure the insulated jumper wire is dressed so the it does not touch components or sharp edges.

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SPECIFICATION

NOTE : Specifications and others are subject to change without notice for improvement.

1. Application Range.

1) This spec sheet is applied all of the LCD TV with LD84J chassis.
2) Not included spec and each product spec in this spec sheet apply correspondingly to the following each country standard and requirement of Buyer

2. Specification

Each part is tested as below without special appointment

1. Temperature : 20±5°C
2. Relative Humidity : 65±10%
3. Power Voltage : Standard input voltage (100~240V@50/60Hz)
   *Standard Voltage of each product is marked by models

2.4 Specification and performance of each parts are followed each drawing and specification by part number in accordance with BOM.

2.5 The receiver must be operated for about 20 minutes prior to the adjustment.

3.Test method

3.1 Performance :
LGE TV test method followed
3.2 Demanded other specification
- Safety : UL,CSA,IEC specification
- EMC : FCC,ICES,IEC specification

4. General Specification

4.1 PC

No	Item		Specification				Remarks
1	Supported Sync. Type		Separate Sync., Digital				
2	Operating Frequency		Analog	Horizontal	30 ~ 83kHz		
				Vertical	56 ~ 75 Hz		
			Digital	Horizontal	30 ~ 83kHz		
				Vertical	56 ~ 75 Hz		
3	Resolution		Analog	Max.	1920x1080 @ 60Hz		
				Recommand	1920x1080 @ 60Hz		
			Digital	Max.	1920x1080 @ 60Hz		
				Recommand	1920x1080 @ 60Hz		
4	Inrush Current		Cold Start : 50 A Hot : 120 A				
5	Operating Condition		Sync (H/V)	Video	LED	Wattage	
	Power S/W On	On mode	On/On	Active	Blue	55W (Max)	
			On/On	Active	Blue	45W (Typ)	
		Sleep mode	Off/On On/Off	Off	Amber	1W	
	Power S/W Off	Off mode	-	Off	Off	1W	
6	MTBF		50,000 HRS with 90% Confidence level				Lamp Life 40,000 Hours (Min)
7	Using Altitude		5,000 m (for Reliability) 3,000m(for FOS)				

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4.2 TV

No	Item	Specification	Remarks
1.	Receiving System	ATSC/64 &256 QAM/NTSC-M	USA ONLY
2.	Available Channel	1)VHF :02~13 2)UHF :14~69 3)DTV :02-69 4)CATV :01~135 5)CADTV :01~135	
3.	Input Voltage	1)AC 100 ~ 240V 50/60Hz	
4.	Market	North America	
5.	Screen Size	23 inch Wide(23.00 inch)	
6.	Aspect Ratio	16:9	
7.	LCD Module	LM230WF1-TLA1(1920 x1080)	Non-Glare,Wide,LPL TN
8.	Operating Environment	1)Temp :0 ~40 deg	
		2)Humidity :~80 %	
9.	Storage Environment	1)Temp :-20 ~60 deg	
		2)Humidity :0 ~90 %	

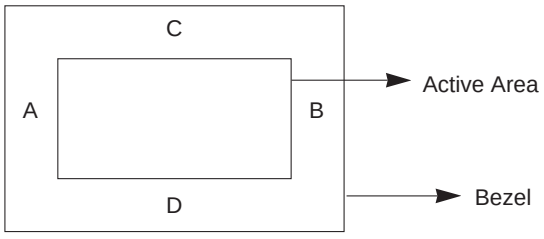
5. Optical characteristic specification

5.1 Chroma &Brightness.

No.	Item	Specification					Remark
				Min	typ	Max	
1.	Viewing Angle<CR>10>	Right/Left		70/70	85/85		
		Up/Down		60/70	75/85		
2.	Luminance	Luminance (cd/m2)		25 0	300		DVI or RGB - Stnadard, 6500K - Full White (100IRE)
		Variance(%)		75			
3.	Contrast Ratio	CR		600	1000		Full White/ Full black
4.	Color Coordinates [CIE 1931]	White	Wx	Typ	0.313	Typ -0.03	DVI or RGB - Stnadard, 6500K - Full White (100IRE)
			Wy		0.329		
		RED	Rx		0.644		
			Ry		0.336		
		Green	Gx		0.295		
			Gy		0.614		
		Blue	Bx		0.146		
			By		0.072		

* Optical Test Condition
- Surrounding Brightness Level : dark
- Surrounding Temperature : 25 ± 5°C
- warm-up Time : 30 Min
- Contrast, Brightness : Outgoing condition
- *Incase of Vivid Mode, high level saturation may be occurred.Check gray linearity at standard mode.

* Active area
- Active area of LCD PANEL is in bezel of cabinet.
- Interval between active area and bezel
  | A-B|<1.0 mm , | C-D|<1.0 mm
  A: Interval between left of active area and bezel
  B: Interval between right of active area and bezel
  C: Interval between top of active area and bezel
  D: Interval between bottom of active area and bezel



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5.2 Chroma (PSM :PC Mode-Standard, AV Mode-Vivid)
** The W/B Tolerance is ±0.002 for Adjustment, but for DQA ±0.015

No	Item		Min	Typ	Max	Remark
1.	Cool	Wx	0.283	0.285	0.287	AV Mode
	(9300K)	Wy	0.291	0.293	0.295	- RF/ AV1,2,3/ Component/ HDMI
2.	Medium	Wx	0.293	0.295	0.297	- Vivid
	(8000K)	Wy	0.203	0.305	0.307	- Cool/ Medium/ Warm: 85IRE
3.	Warm	Wx	0.311	0.313	0.315	
	(6500K)	Wy	0.327	0.329	0.331	
4.	6500k	Wx	0.283	0.313	0.343	PC Mode
		Wy	0.299	0.329	0.359	- RGB/ DVI
5.	9300k	Wx	0.253	0.283	0.313	- Stnadard
		Wy	0.268	0.298	0.328	- 6500K/ 9300K :Full White 100IRE

*The spec range of Color coordinates is same with the one of module,because this model does not adjust white balance.

6. SET Optical Feature

6.1 PC Mode (Measurement Condition:Full white/Standard/6500k)-> Measure the black luminance after 30 seconds.

No	Item	Luminance(cd/m^2)			C/R		Remark
		Min	Typ	Max	Min	Typ	
1	23 inch	250	300		600:1	1000:1	DFC 30,000:1

6.2 AV Mode (Measurement Condition:Full white(100IRE)/Vivid)-> Measure the black luminance after 30 seconds.

No	Item	Luminance(cd/m^2)			C/R(Min)	Remark
		Min	Typ	Max	RF,AV,COMPONENT,HDMI	
1	23 inch	170	220		400:1	

6.3 Dynamic CR
- Dynamic CR Working Condition : Full Black Pattern(All Black, No pattern(MSPG Pattern# 2)) signal in D- sub & DVI

No	Item	Min	Typ	Max	Remark
1	M237WD-PMJ	24000: 1	30000: 1		For Checking Black Luminance, wait for over 1 minute.

7. Mechanical specification

No	Item		Content				Unit	Remark
1	Product Dimension		Width(W)	Length(L)	Height(H)			
		Before Packing	560.8	193.2	427		mm	
		After Packing	651	456	161		mm	
2	Product	Only SET	5.6				Kg	
		With BOX	7.4				Kg	
3	Cintaniner Loding Quantity	Individual or Palletizing	20ft		40ft			
			Indi.	Wooden	Indi.	Wooden		
			630	520	1260	1144		
4	Stand Assy	Type	Detachable					
		Size (W x D x H)	271.2 x 193.2 x 108.4					
		Tilt Degree	-5~15degree					
		Tilt force	0.8~3.5kgf					
5	Appearance	General	Refer to Standard of LG(56)G1-1020					

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8. Component Video Input (Y, P_B, P_R)

No.	Specification			Remark
	Resolution	H-freq(kHz)	V-freq(Hz)	
1.	720* 480	15.73	59.94	SDTV ,DVD 480I
2.	720* 480	15.73	60.00	SDTV ,DVD 480I
3.	720* 480	31.47	59.94	SDTV 480P
4.	720* 480	31.50	60.00	SDTV 480P
5.	1280* 720	44.96	59.94	HDTV 720P
6.	1280* 720	45.00	60.00	HDTV 720P
7.	1920* 1080	33.72	59.94	HDTV 1080I
8.	1920* 1080	33.75	60.00	HDTV 1080I
9.	1920* 1080	23.0	24.0	HDTV 1080P
10.	1920* 1080	33.75	30	HDTV 1080P
11.	1920* 1080	67.43	59.94	HDTV 1080P
12.	1920* 1080	67.5	60	HDTV 1080P

10. RGB/DVI

10.1 Input (PC)

No.	Resolution	H-freq(kHz)	V-freq(Hz)	Pixel clock(MHz)	Remark
1	720*400	31.468	70.08	28.321	
2	640*480	31.469	59.94	25.175	Input 848x480 60Hz, 852x480 60Hz -> 640x480 60Hz Display
3	640*480	37.5	75	31.5	
4	800*600	37.879	60.317	40.0	
5	800*600	46.875	75.0	49.5	
6	1024*768	48.363	60.0	65.0	
7	1024*768	60.123	75.029	78.75	
8	1152* 864	67.500	75.000	108.0	
9	1280* 1024	63.981	60.02	108.0	
10	1280* 1024	79.976	75.035	135.0	
11	1680* 1050	64.674	59.883	119.0	
12	1680* 1050	65.290	59.954 1	46.25	
13	1600* 1200	75.0	60.0	162.0	
14	1920* 1080	66.587	59.934	138.5	

10.3 RGB EDID Data

- Analog EDID_Product ID :22251

	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08	0x09	0x0A	0x0B	0x0C	0x0D	0x0E	0x0
0x00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	EB	56	01	01	01	01
0x01	01	12	01	03	08	33	1C	78	EA	C9	A5	A4	56	4B	9D	25
0x02	12	50	54	A5	6B	80	81	8F	71	40	B3	00	81	4F	01	01
0x03	01	01	01	01	01	01	1A	36	80	A0	70	38	1F	40	30	20
0x04	35	00	FD	1E	11	00	00	1A	00	00	00	FD	00	38	4B	1E
0x05	53	11	00	0A	20	20	20	20	20	20	00	00	00	FC	00	4D
0x06	32	33	37	57	44	0A	20	20	20	20	20	20	00	00	00	FC
0x07	00	0A	20	20	20	20	20	20	20	20	20	20	20	20	00	81

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- DVI(Digital)EDID_Product ID :22252

	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08	0x09	0x0A	0x0B	0x0C	0x0D	0x0E	0x0F
0x00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	EC	56	01 *	01	01	01
0x01	01 **	12	01 ***	03	80	33	1C	78	EA	C9	A5	A4	56	4B	9D	25
0x02	12	50	54	A5	6B	80	81	80	81	8F	71	40	B3	00	81	4F
0x03	D1	C0	01	01	01	01	1A	36	80	A0	70	38	1F	40	30	20
0x04	35	00	FD	1E	11	00	00	1A	21	39	90	30	62	1A	27	40
0x05	68	B0	36	00	FD	1E	11	00	00	1C	00	00	00	FD	00	38
0x06	4B	1E	53	11	00	0A	20	20	20	20	20	20	00	00	00	FC
0x07	00	4D	32	33	37	57	44	0A	20	20	20	20	20	20	00	6D ***

- Adjustable Data :
  *: Serial No. .(Input the S/ N at Total Assembly line)
  **: week
  ***: year ex) when year 2006 : input “10”
  **** : CHECK SUM (deferent along Serial No, week, year)

12. HDMI1,2

12.1 Input (DTV: For Video, PC is not Supported)

No.	Resolution	H-freq(kHz)	V-freq(Hz)	Pixel clock(MHz)	Remark
1	720* 480	31.469 / 31.5	59.94 / 60	23.00/ 23.03	SDTV 480P
2	720* 576	31.25	50	54	SDTV 576P
3	1280* 720	37.500	50	74.25	HDTV 720P
4	1280* 720	44.96 / 45	59.94 / 60	74.17/ 74.25	HDTV 720P
5	1920* 1080	33.72 / 33.75	59.94 / 60	74.17/ 74.25	HDTV 1080I
6	1920* 1080	28.125	50.00	74.25	HDTV 1080I
7	1920* 1080	26.97 / 23	23.97 / 24	74.17/ 74.25	HDTV 1080P
8	1920* 1080	33.716 / 33.75	29.976 / 30.00	74.25	HDTV 1080P
9	1920* 1080	56.250	50	148.5	HDTV 1080P
10	1920* 1080	67.43 / 67.5	59.94 / 60	148.35/ 148.50	HDTV 1080P

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11.2 EDID Data

- HDMI EDID - Product ID : 22253 (HDMI1 and HDMI2 have the Same EDID)

1) HDMI1

128 B | 256 B | Summary

	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08	0x09	0x0A	0x0B	0x0C	0x0D	0x0E	0x0F
0x00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	ED	56	01	01	01	01
0x01	01	12	01	03	80	33	1C	78	0A	C9	A5	A4	56	4B	9D	25
0x02	12	50	54	A5	6F	00	81	80	81	8F	71	40	B3	00	81	4F
0x03	D1	C0	01	01	01	01	1A	36	80	A0	70	38	1F	40	30	20
0x04	35	00	FD	1E	11	00	00	1A	21	39	90	30	62	1A	27	40
0x05	68	B0	36	00	FD	1E	11	00	00	1C	00	00	00	FD	00	38
0x06	4B	1E	53	11	00	0A	20	20	20	20	20	20	00	00	00	FC
0x07	00	4D	32	33	37	57	44	0A	20	20	20	20	20	20	01	C7

128 B | 256 B | Summary

	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08	0x09	0x0A	0x0B	0x0C	0x0D	0x0E	0x0F
0x00	02	03	22	F1	4E	84	05	03	02	20	22	10	11	13	12	14
0x01	1F	07	16	26	15	07	50	09	07	07	67	03	0C	00	10	00
0x02	B8	2C	01	1D	00	72	51	D0	1E	20	38	88	15	00	FD	1E
0x03	11	00	00	1E	01	1D	80	18	71	1C	16	20	58	2C	25	00
0x04	FD	1E	11	00	00	9E	8C	0A	D0	8A	20	E0	2D	10	10	3E
0x05	96	00	FD	1E	11	00	00	18	8C	0A	D0	8A	20	E0	2D	10
0x06	10	3E	96	00	FD	1E	11	00	00	18	02	3A	80	18	71	38
0x07	2D	40	58	2C	45	00	FD	1E	11	00	00	1E	00	00	00	80

2) HDMI2

128 B | 256 B | Summary

	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08	0x09	0x0A	0x0B	0x0C	0x0D	0x0E	0x0F
0x00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	ED	56	01	01	01	01
0x01	01	12	01	03	80	33	1C	78	0A	C9	A5	A4	56	4B	9D	25
0x02	12	50	54	A5	6F	00	81	80	81	8F	71	40	B3	00	81	4F
0x03	D1	C0	01	01	01	01	1A	36	80	A0	70	38	1F	40	30	20
0x04	35	00	FD	1E	11	00	00	1A	21	39	90	30	62	1A	27	40
0x05	68	B0	36	00	FD	1E	11	00	00	1C	00	00	00	FD	00	38
0x06	4B	1E	53	11	00	0A	20	20	20	20	20	20	00	00	00	FC
0x07	00	4D	32	33	37	57	44	0A	20	20	20	20	20	20	01	C7

128 B | 256 B | Summary

	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08	0x09	0x0A	0x0B	0x0C	0x0D	0x0E	0x0F
0x00	02	03	22	F1	4E	84	05	03	02	20	22	10	11	13	12	14
0x01	1F	07	16	26	15	07	50	09	07	07	67	03	0C	00	20	00
0x02	B8	2C	01	1D	00	72	51	D0	1E	20	38	88	15	00	FD	1E
0x03	11	00	00	1E	01	1D	80	18	71	1C	16	20	58	2C	25	00
0x04	FD	1E	11	00	00	9E	8C	0A	D0	8A	20	E0	2D	10	10	3E
0x05	96	00	FD	1E	11	00	00	18	8C	0A	D0	8A	20	E0	2D	10
0x06	10	3E	96	00	FD	1E	11	00	00	18	02	3A	80	18	71	38
0x07	2D	40	58	2C	45	00	FD	1E	11	00	00	1E	00	00	00	70

1) All data are HEXA

2) Adjustable Data :

*: Serial No.

**: week

***: year ex) when year 2008 : input “12”

**** : CHECK SUM (deferent along Serial No, week, year)

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ADJUSTMENT INSTRUCTION

1. Application

1) This spec sheet is applied all of the LCD TV with LD84J chassis.
2)Not included spec and each product spec in this spec sheet apply correspondingly to the following each country standard and requirement of Buyer

2. Designation

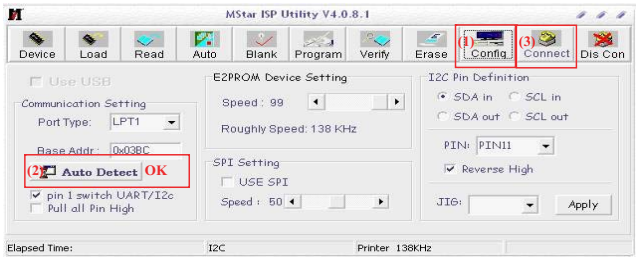
1) The adjustment is according to the order which is designated and which must be followed, according to the plan which can be changed only on agreeing.
2) Power Adjustment: Free Voltage
3) Magnetic Field Condition: Nil.
4) Input signal Unit: Product Specification Standard
5) Reserve after operation: Above 30 Minutes
6) Adjustment equipments: Color Analyzer(CA- 210 or CA-110), Pattern Generator (MSPG- 925L or Equivalent), DDC Adjustment Jig equipment, SVC remote controller

3. Main PCB check process

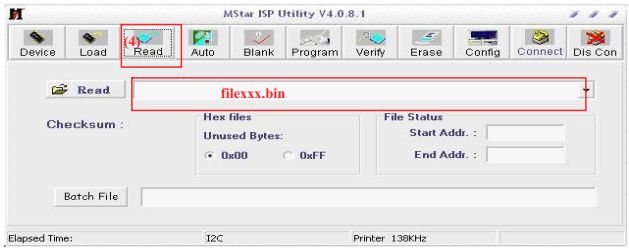
APC - After Manual-Insult, executing APC

Download

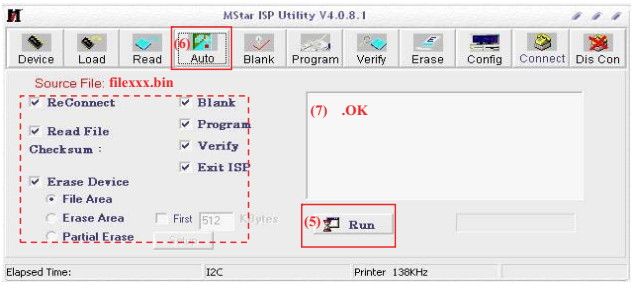
1. Execute ISP program "Mstar ISP Utility" and then click "Config" tab.
2. Set as below, and then click "Auto Detect" and check "OK" message.
   If display "Error", Check connect computer, jig, and set.
3. Click "Connect" tab.
   If display "Can't ", Check connect computer, jig, and set.



4. Click "Read" tab, and then load download file(XXXX.bin) by clicking "Read"



5. Click "Auto" tab and set as below
6. Click "Run".
7. After downloading, check "OK" message.



3.1 ADC Process

3.1.1 PC input ADC

3.1.1.1 Auto RGB Gain/Offset Adjustment

• Convert to PC in Input-source

I2C COMMAND: 0xF4(SELECT_INPUT)0x00 0x60 (RGB)

cf. 0x10(TV),0x20(AV),0x40(COMPONENT),0x60(RGB), 0x90(HDMI)

• Signal equipment displays

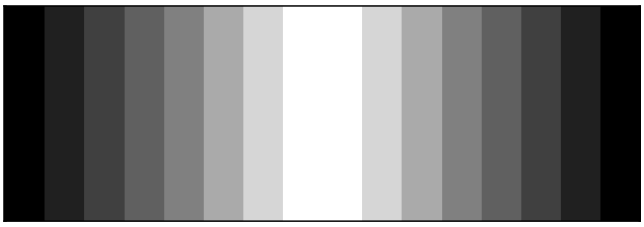
Output Voltage : 700 mVp-p

Impress Resolution XGA (1024 x 768 @ 60Hz)

Model: 60 in Pattern Generator

Pattern: 29 in Pattern Generator (MSPG-925 SERISE)

[gray pattern that left & right is black and center is white signal (Refer below picture)].



Adjustment pattern (PC)

• Adjust by commanding AUTO_COLOR_ADJUST(0xF1) 0x00 0x02 instruction.

3.1.1.2 Confirmation

• We confirm whether "0xB6(RGB)" address of EEPROM "0xA2" is "0xAA"or not.
• If "0xB6(RGB)" address of EEPROM "0xB2" isn't "0xAA", we adjust once more
• We can confirm the ADC values from "0xB0~ 0xB5(RGB)" addresses in a page "0xA2"

*Manual ADC process using Service Remocon. After enter Service Mode by pushing "INSTART" key, execute "Auto-RGB" by pushing "▶" key at "Auto-RGB".

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3.2.1COMPONENT input ADC

3.2.1.1Component Gain/Offset Adjustment

- Convert to Component in Input-source
  I2C COMMAND :0xF4(SELECT_INPUT)0x00 0x40 (COMPONENT)
  cf.0x10(TV),0x20(AV),0x40(COMPONENT), 0x60(RGB),0x90(HDMI)
- Signal equipment displays at SD Mode
  Impress Resolution: 480i
  MODEL :209in Pattern Generator(SD Mode)
  PATTERN :08in Pattern Generator(MSPG-925 SERISE)
- Signal equipment displays at HD Mode
  Impress Resolution:1080i
  MODEL :223in Pattern Generator(HD Mode)
  PATTERN :08in Pattern Generator(MSPG-925 SERISE)

Adjustment pattern (COMPONENT)

- Adjust by commanding AUTO_COLOR_ADJUST(0xF1) 0x00 0x02 instruction

3.2.1.2 Confirmation

- We confirm whether “0xC8(1080i)”address of EEPROM “0xA2” is “0xAA” or not.
- If “0xC8(1080i)” address of EEPROM “0xA2” isn’t “0xAA”, we adjust once more
- We can confirm the ADC values from “0xC2~(1080i)” addresses in a page “0xA2”

3.2 Function Check

3.2.1 Check display and sound

- Check Input and Signal items. (cf. work instructions)
  1.TV
  2.AV (CVBS/ S-Video)
  3.COMPONENT (1080i)
  4.RGB (PC: 1680X1050 @60Hz)
  5.HDMI
  6.PC Audio In and H/P Out

* Display and Sound check is executed by Remote controller.

4. Total Assembly line process

4.1 Adjustment Preparation

- Above 30 minutes H/run in RF no signal
- 15 Pin D-Sub Connector, for IIIC communication not including VGA signal,is connected to AUTO W/B EQUIPMENT..

4.2 Check coordinate of 9300K

- Set Input mode to RGB.
- Set Temperature : 9300K
- Adjust x: 0.285±0.005, y: 0.293±0.005(9300°K)
  (Full white MSPG series Pattern 4)

4.3 Check color coordinate of 6500K

- Set Input mode to RGB.
- Set Temperature : 6500K
- Adjust x:0.313±0.005, y:0.329±0.005(6500°K)
  (Full white MSPG series Pattern 4)

4.4 DPM operation confirmation (Only Apply for MNT Model)
Check if Power LED Color and Power Consumption operate as standard.

- Set Input to RGB and connect D-sub cable to set
- Measurement Condition : (100~240V@50/60Hz)
- Confirm DPM operation at the state of screen without Signal

4.5 DDC EDID Write Model Name(M237WD-PMJ):

- Connect D- sub Signal Cable to D-Sub Jack.
- Connect DVI Signal Cable to DVI Jack.
- Connect HDMI1,2 Signal Cable to HDMI1,2 Jack.
- Write EDID DATA to EEPROM(24C02) by using DDC2B protocol.
- Check whether written EDID data is correct or not.
  (refer to Product spec).

4.6 HDCP (High-Bandwidth Digital Contents Protection)SETTING

- Connect D-sub Signal Cable to D-Sub Jack
- Input HDCP key with HDCP-key-in-program
- HDCP Key value is stored on EEPROM(AT24C512) which is 80~A1 addresses of 0xA0~0xA2 page
- AC off/on and on HDCP button of MSPG925 and confirm whether picture is displayed or not of using MSPG925
- HDCP Key value is different among the sets.

4.7 Outgoing condition Configuration

- After all function test., press IN-STOP Key by SVC Remote controller. And Make Ship Condition.
- When pressing IN-STOP key by SVC remocon, Red LED are blinked alternatively. And then Automatically turn off. (Must not AC power OFF during blinking)

4.8 Internal pressure

- Confirm whether is normal or not when between power board's ac block and GND is impacked on 1.5kV(dc) or 2.2kV(dc) for one second

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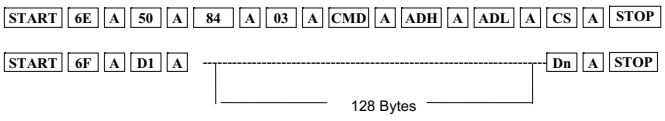
5. Adjustment Command

5.1 Adjustment Commands(LEMGTH=84)

No.	Adjustment Contents	CMD	ADR	VAL	Description
1	FACTORY ON	E0	00	00	Factory mode on
2	FACTORY OFF	E2	00	00	Factory mode off
3	EEPROM ALL INIT.	E4	00	00	EEPROM All clear
4	EEPROM Read	E7	00	00	EEPROM Read
5	EEPROM Write	E8	00	Data	EEPROM Write by some values
6	COLOR SAVE (R/G/B cutoff) Drive, Contrast, Bright)	EB	00	00	Color Save
7	H POSITION	20	00	00~100	They have different range mode, FOS Adjustment
8	V POSITION	30	00	00~100	
9	CLOCK	90	00	00~100	
10	PHASE	92	00	00~100	
11	R DRIVE	16	00	00~FF	Drive adjustment
12	G DRIVE	18	00	00~FF	
13	B DRIVE	1A	00	00~FF	
14	R CUTOFF	80	00	00~7F	Offset adjustment
15	G CUTOFF	82	00	00~7F	
16	B CUTOFF	84	00	00~7F	
17	BRIGHT	10	00	00~3F	Bright adjustment
19	CONTRAST	12	00	00~64	Luminance adjustment
20	AUTO_COLOR_ADJUST	F1	00	02	Auto COLOR Adjustment
21	CHANGE_COLOR_TEMP	F2	00	0,1,2,3	0: COOL 1: NORMAL 2: WARM 3: USER
22	FACTORY_DEFAULT	F3	00	00	Factory mode off & II_SW is 1 & Input change to TV
23	AUTO_INPUTCHANGE	F4	00	0,1,2,4	0 : TV 1 : AV1 2 : AV2 3 : Component 4 : RGB 5 : DVI 6 : HDMI

5.2 EEPROM DATA READ

5.2.1 Signal Table



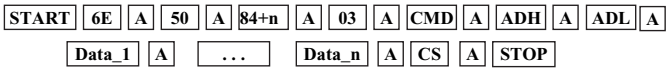
5.2.2 Command Set

No.	Adjustment contents	CMD	ADH	ADL	Details
1	EEPROM READ	E7	A0	0	0-Page 0~7F Read
2				80	0-Page 80~FF Read
3			A2	0	1-Page 0~7F Read
4				80	1-Page 80~FF Read
5			A4	0	2-Page 0~7F Read
6				80	2-Page 80~FF Read
7			A6	0	3-Page 0~7F Read
8				80	3-Page 80~FF Read

*use: To read the appointment Address of E

5.3 E^{2}PROM Data Write

5.3.1 Signal Table



LEN : 84h + Byte
CMD : 8Eh
ADH : E^{2}PROM Slave Address (A0, A2, A4, A8), Not 00h
(Reserved by Buffer to E^{2}PROM)
ADL : E^{2}PROM Sub Address (00~ FF)
Data : Write data

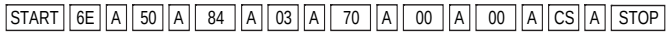
5.3.2 Command Set

No.	Adjustment contents	CMD(hex)	LEN	Details
1	EEPROM WRITE	E8	94	16-Byte Write
2			84+n	n-byte Write

- use
  - EDID write : 16-byte by 16-byte, 8 order (128-byte) write(TO “00 – 7F” of “EEPROM Page A4”)
  - FOS Default write : 16-mode data (HFh,HFl,VF,STD,HP,VP,Clk,ClkPh,PhFine) write
  - Random Data write : write the appointment Address of E2PROM

5.4 VRAM Read

- Send CMD(70h) to read Video RAM value from MICOM And save its value to 128-Bytes Buffer(Common Buffer for the use of EDID)



- Delay 500ms (Time to Wait and Read Video RAM from MICOM)
- Be transmitted the contents of MICOM’s 128-bytes Buffer to PC.

(128th Data is the CheckSum of 127-bytes data : That’s OK if the value of adding 128-bytes Data is Zero)

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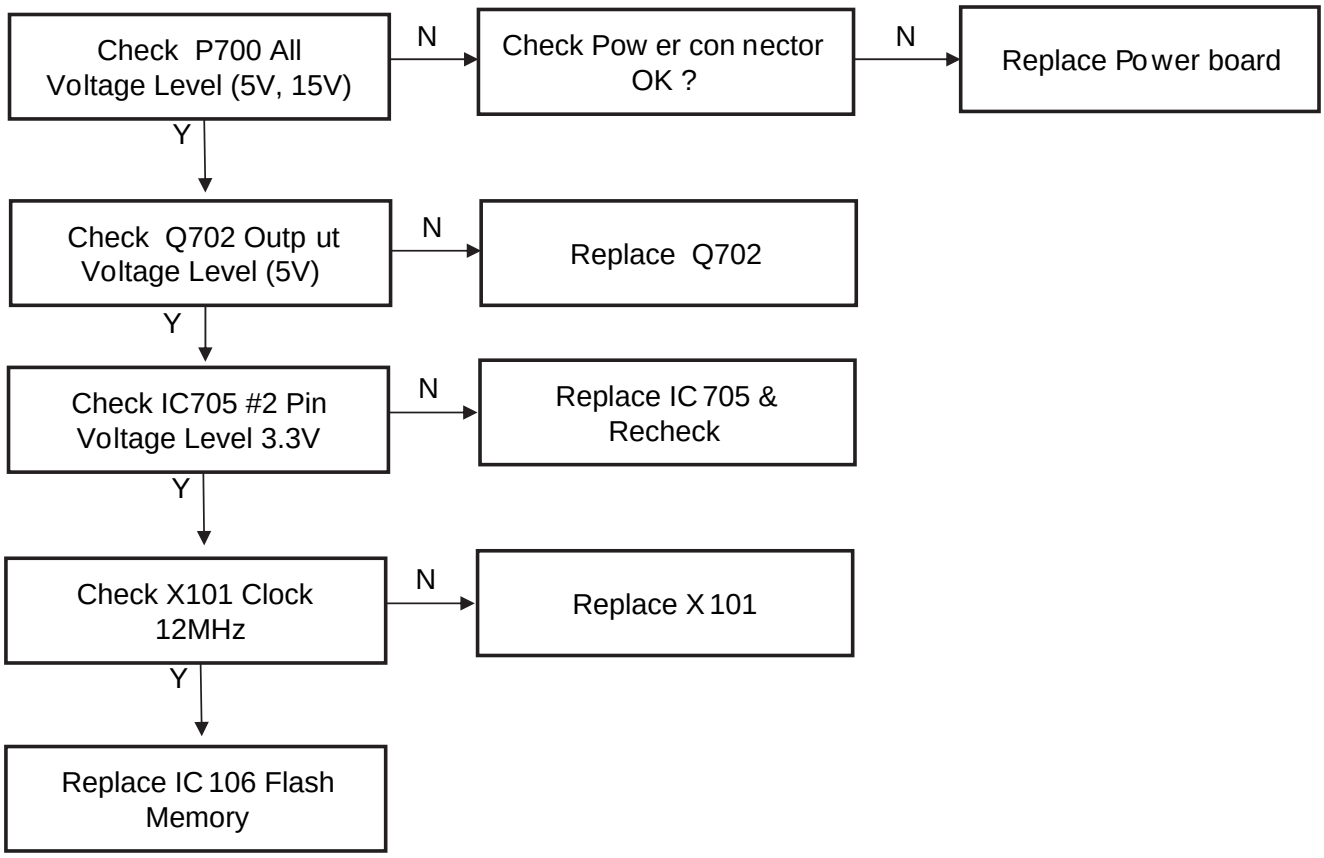
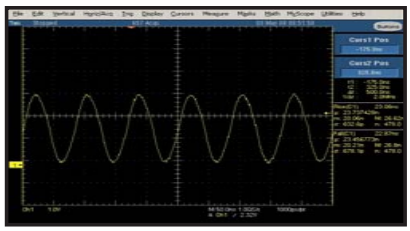
TROUBLESHOOTING

1. Power- Up Boot Fail Trouble Shooting





Wave form of X101

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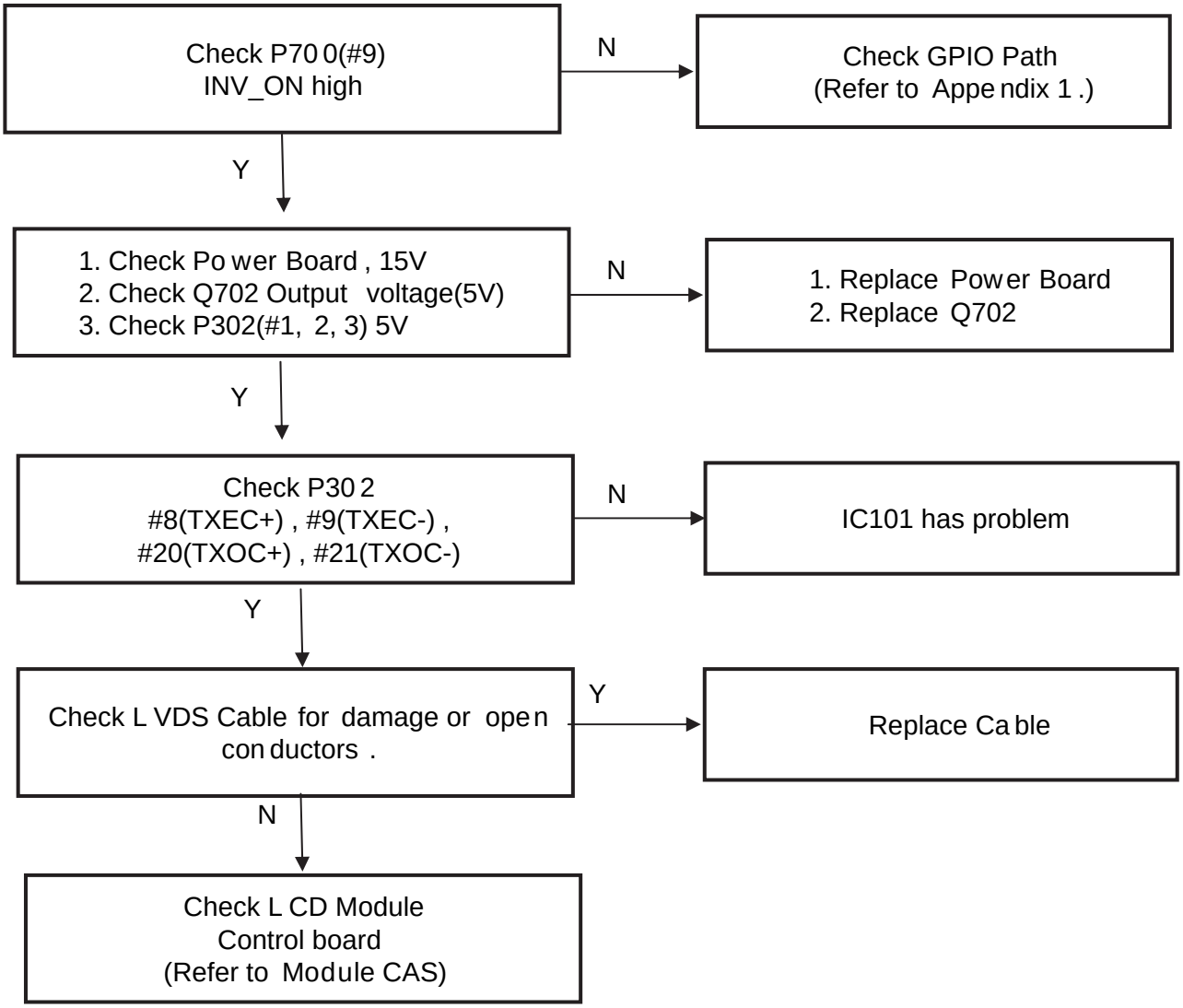
2. No OSD Trouble Shooting



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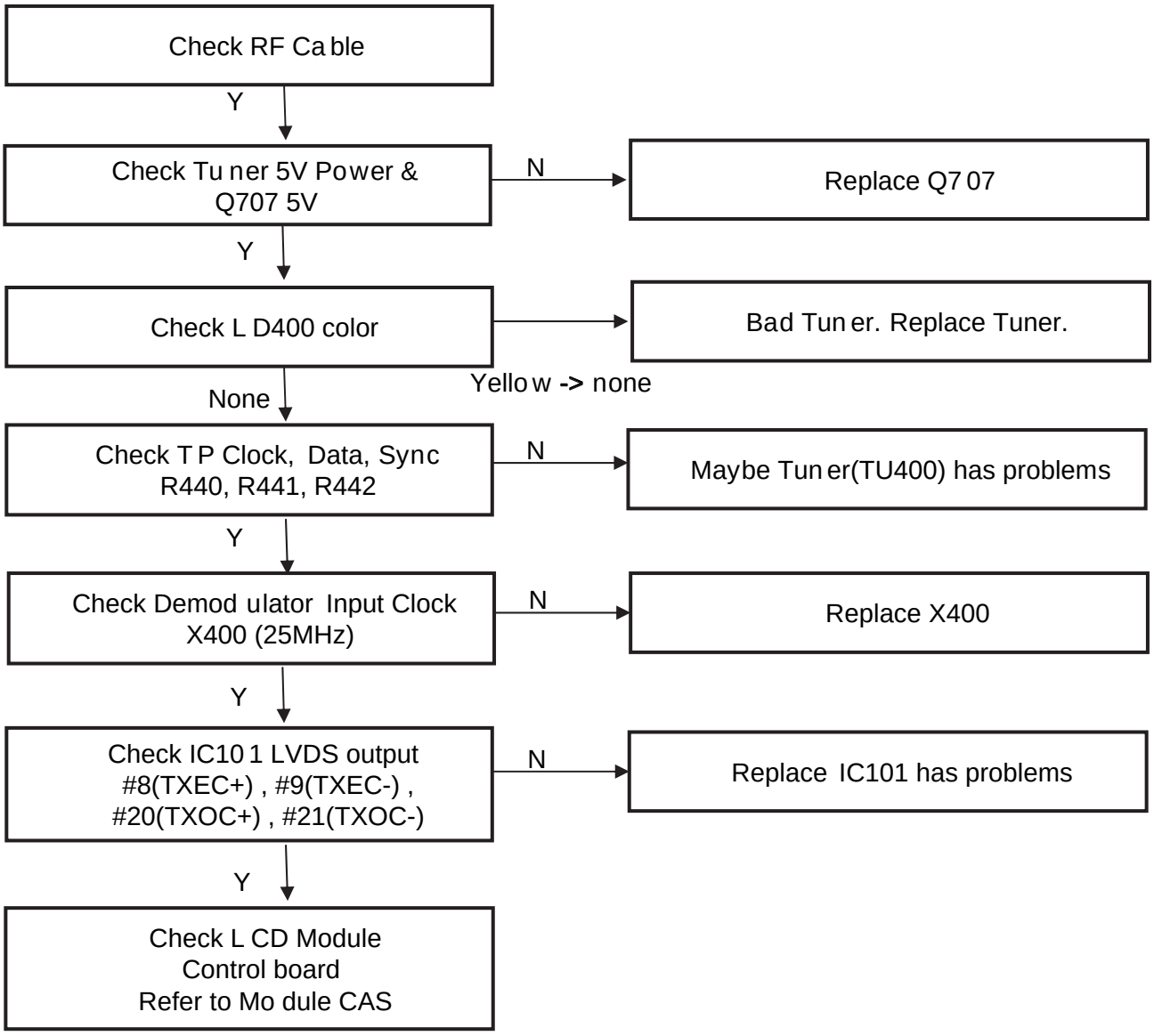
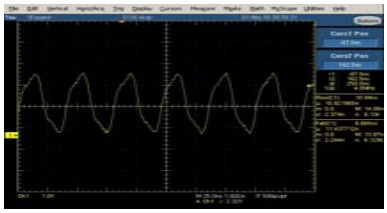
3. Digital TV Video Trouble Shooting





Wave form of X400

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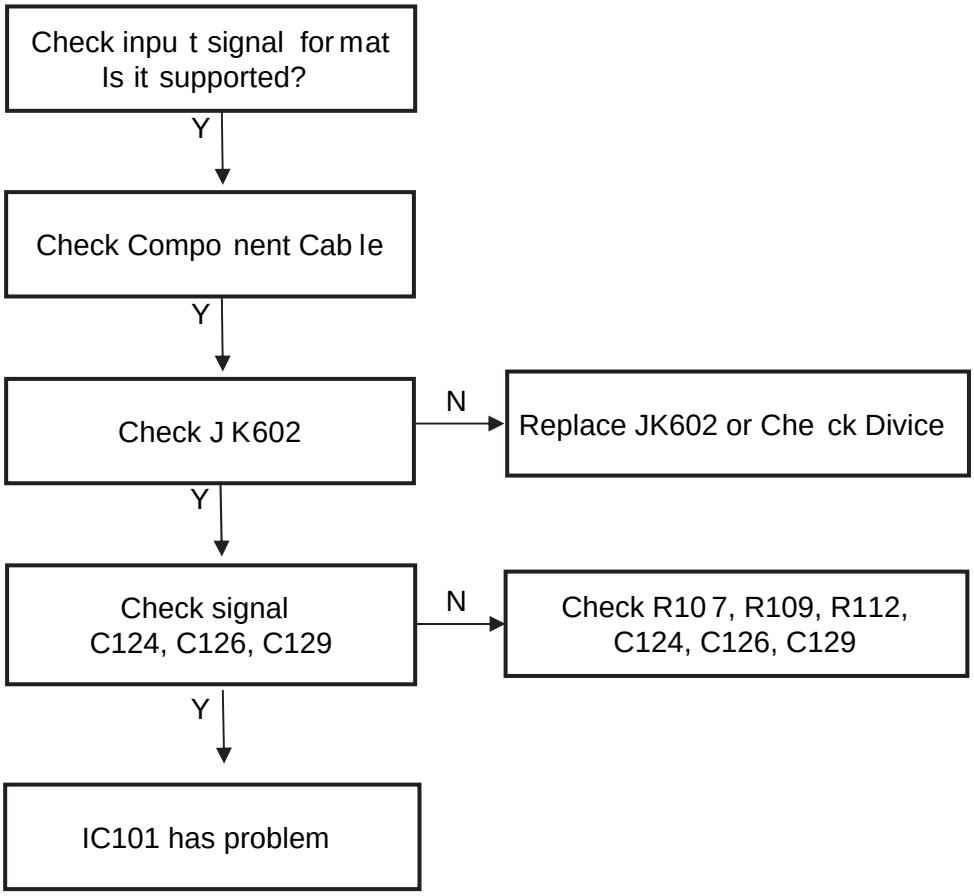
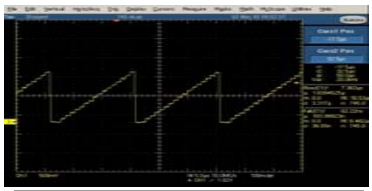
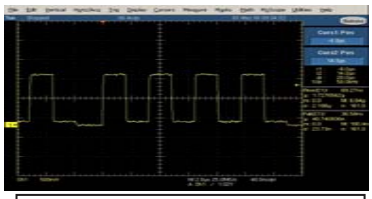
4. Component Video Trouble Shooting

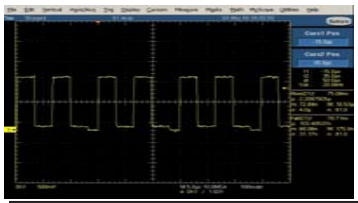




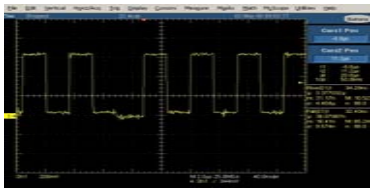
Wave form of Comp Y



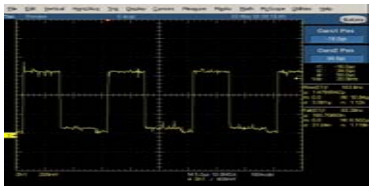
Wave form of Comp Pb



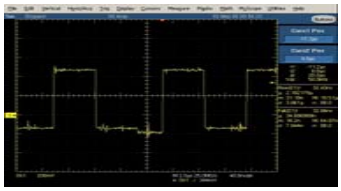
Wave form of Comp Pr



Wave form of C124



Wave form of C126



Wave form of C129

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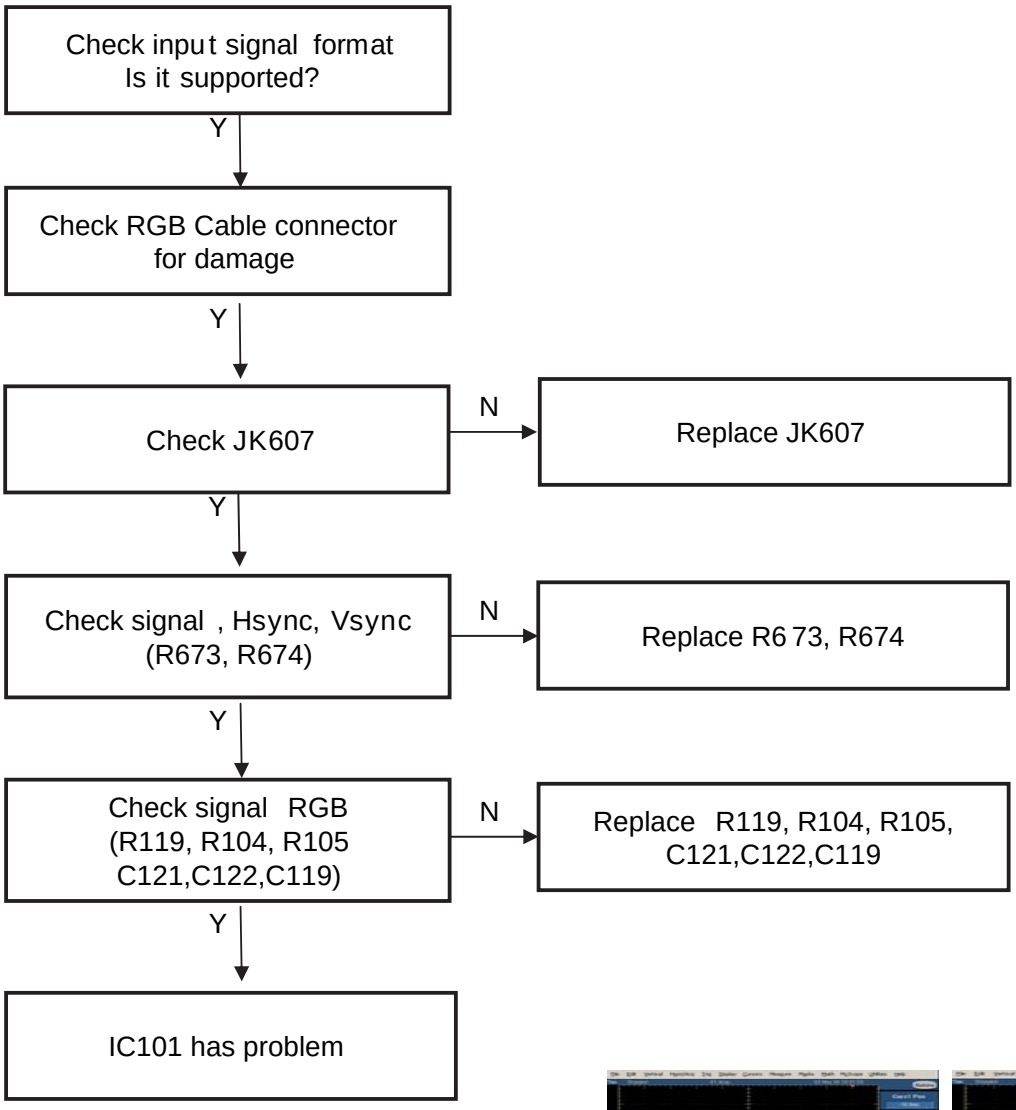
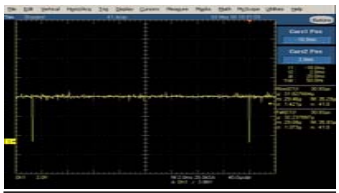
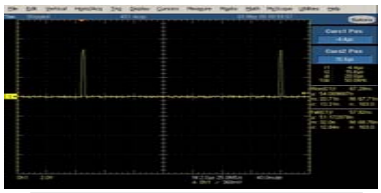
5. RGB Video Trouble Shooting

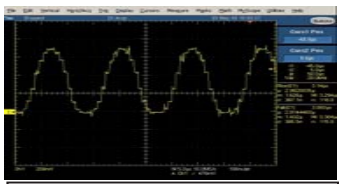




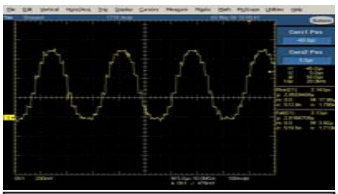
Wave form of R673(Vsync)



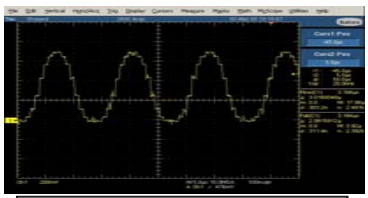
Wave form of R673(Vsync)



Wave form of R105/C122



Wave form of R104/C121



Wave form of R119/C119

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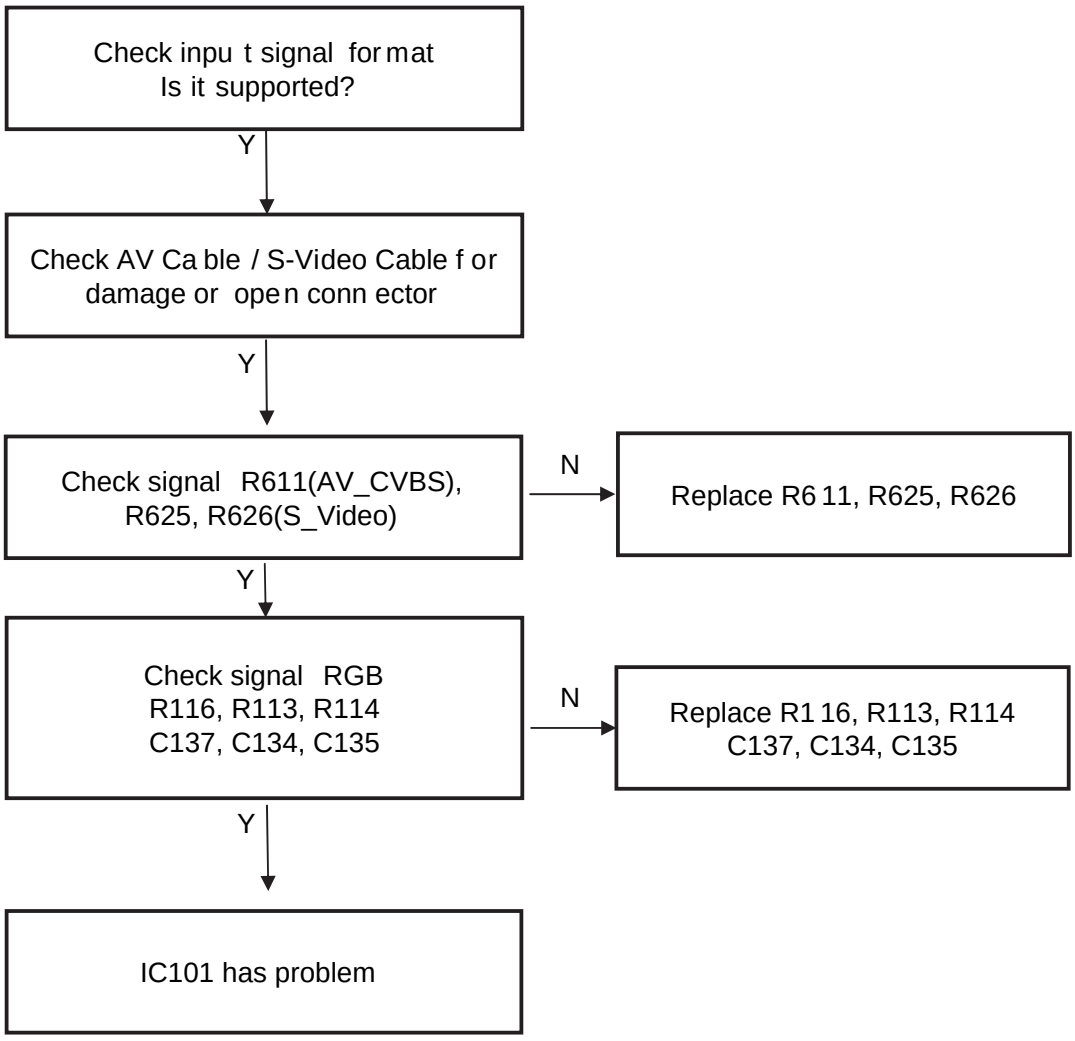
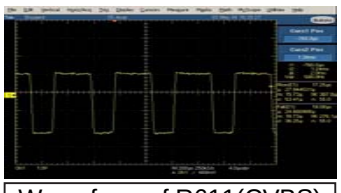
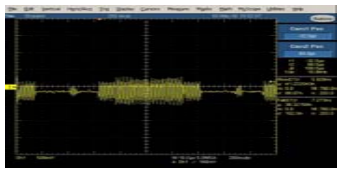
6. AV Video Trouble Shooting

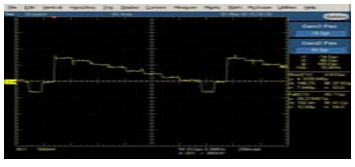




Wave form of R611(CVBS)



Wave form of R625(S-video)



Wave form of R626(S-video)

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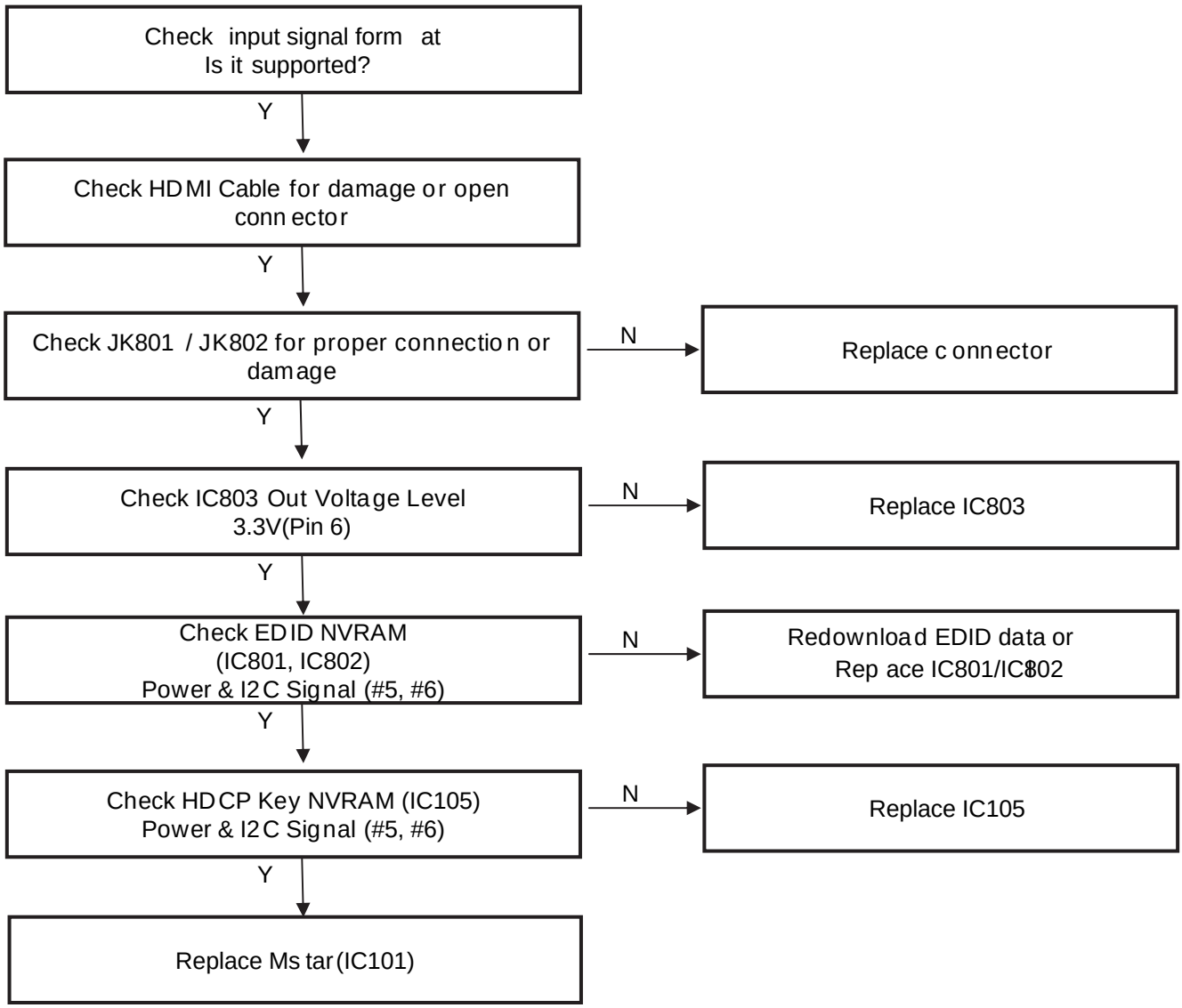
7.HDMI Video Trouble Shooting



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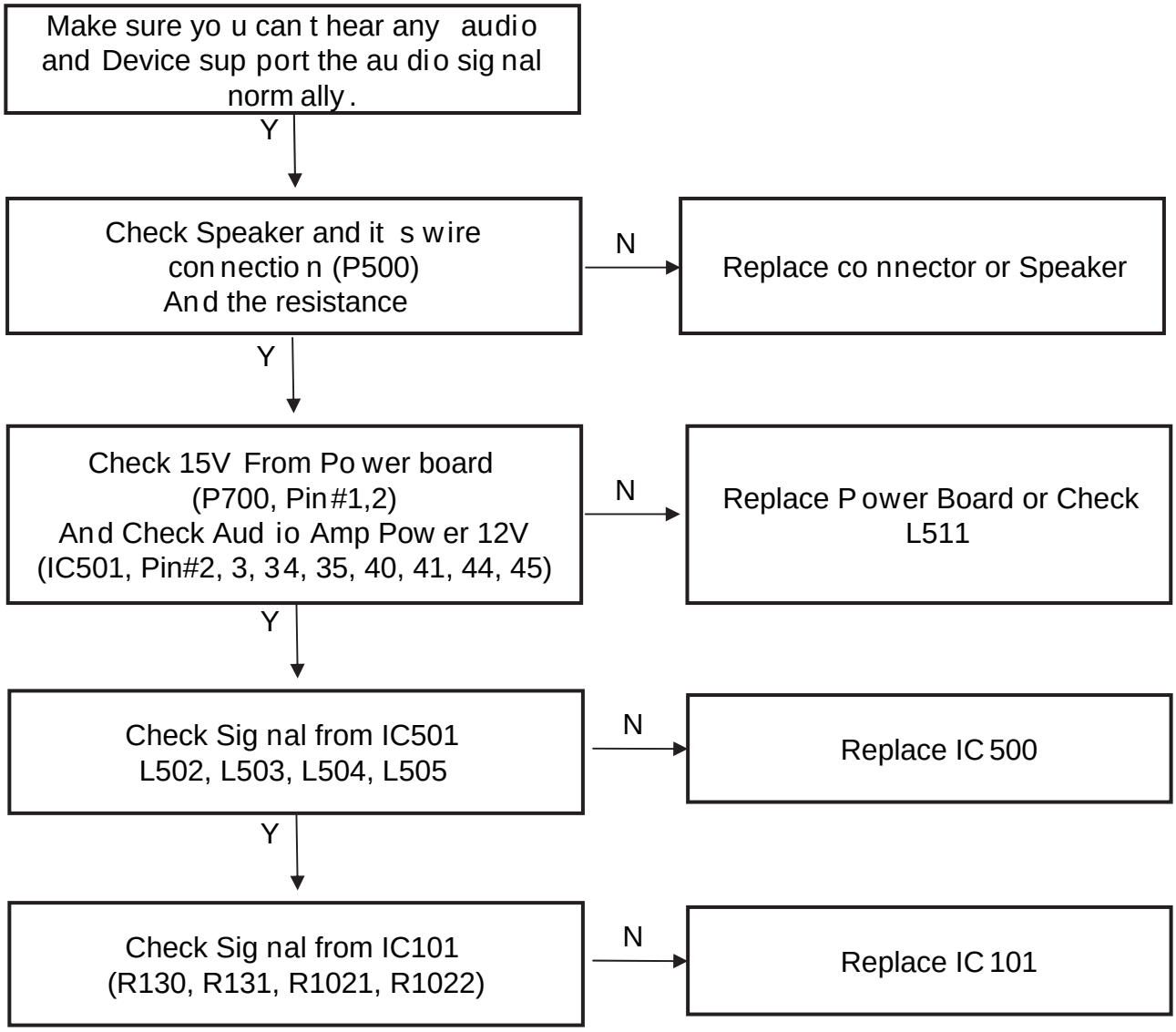
8. All Source Audio Trouble Shooting


Make sure yo u can t hear any audio and Device sup port the au dio sig nal norm ally .
Y
Check Speaker and it s wire con nectio n (P500) And the resistance
N
Replace co nnector or Speaker
Y
Check 15V From Po wer board (P700, Pin#1,2) And Check Aud io Amp Pow er 12V (IC501, Pin#2, 3, 34, 35, 40, 41, 44, 45)
N
Replace P ower Board or Check L511
Y
Check Sig nal from IC501 L502, L503, L504, L505
N
Replace IC 500
Y
Check Sig nal from IC101 (R130, R131, R1021, R1022)
N
Replace IC 101

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Appendix 1. GPIO Path.

PIN NO.	DATA SHEET	PIN Type	FUNCTION	Schematic
75	GPIO20	I/O w/ 5V-tolerant	General Purpose Input/Output; 4mA driving strength	MUTE
76	GPIO21	I/O w/ 5V-tolerant	General Purpose Input/Output; 4mA driving strength	/PWR_ON
77	GPIO22	I/O w/ 5V-tolerant	General Purpose Input/Output; 4mA driving strength	SVIDEO_SW
78	GPIO23	I/O w/ 5V-tolerant	General Purpose Input/Output; 4mA driving strength	RGB_SW
80	GPIO25	I/O w/ 5V-tolerant	General Purpose Input/Output; 4mA driving strength	MOD_ON
81	GPIO26	I/O w/ 5V-tolerant	General Purpose Input/Output; 4mA driving strength	HPDCTRL2
82	GPIO27	I/O w/ 5V-tolerant	General Purpose Input/Output; 4mA driving strength	WP_EDID
83	GPIO28	I/O w/ 5V-tolerant	General Purpose Input/Output; 4mA driving strength	VSB_CTRL
99	GPIO44/ I2S_IN_WS	I/O w/ 5V-tolerant	Word Select Input	HDMI_SEL0
100	GPIO45 / I2S_	Input	Audio Bit Clock Input	HDMI_SEL1
103	SPDIFO	Output	S/PDIF Audio Output; 4mA driving strength	AUD_SPDIF_OUT
110	GPIO66	I/O w/ 5V-tolerant	General Purpose Input/Output; 4mA driving strength	HDMI_DET1
111	GPIO65	I/O w/ 5V-tolerant	General Purpose Input/Output; 4mA driving strength	AV1_SW
112	GPIO64	I/O w/ 5V-tolerant	General Purpose Input/Output; 4mA driving strength	COMP_SW1
113	GPIO63	I/O w/ 5V-tolerant	General Purpose Input/Output; 4mA driving strength	DVI_DET
120	SAR2	Analog Input	SAR Low Speed ADC Input 2; General Purpose Input/Output	HDMI_DET2
121	SAR3	Analog Input	SAR Low Speed ADC Input 3; General Purpose Input/Output	WP_FLASH
135	LVA4P	Output	LVDS A-Link Channel 4 Positive Data Output	USB_OCD_N
136	LVA4M	Output	LVDS A-Link Channel 4 Negative Data Output	USB_CTRL
164	GPIO100	I/O w/ 5V-tolerant	General Purpose Input/Output; 4mA driving strength	LED_GR
165	GPIO99	I/O w/ 5V-tolerant	General Purpose Input/Output; 4mA driving strength	LED_AM
166	GPIO98	I/O w/ 5V-tolerant	General Purpose Input/Output; 4mA driving strength	SE
167	GPIO97	I/O w/ 5V-tolerant	General Purpose Input/Output; 4mA driving strength	INV_ON
251	USB_DM	Analog I/O	USB Inverting Data Input/Output	USB_DM
252	USB_DP	Analog I/O	USB Non Inverting Data Input/Output	USB_DP

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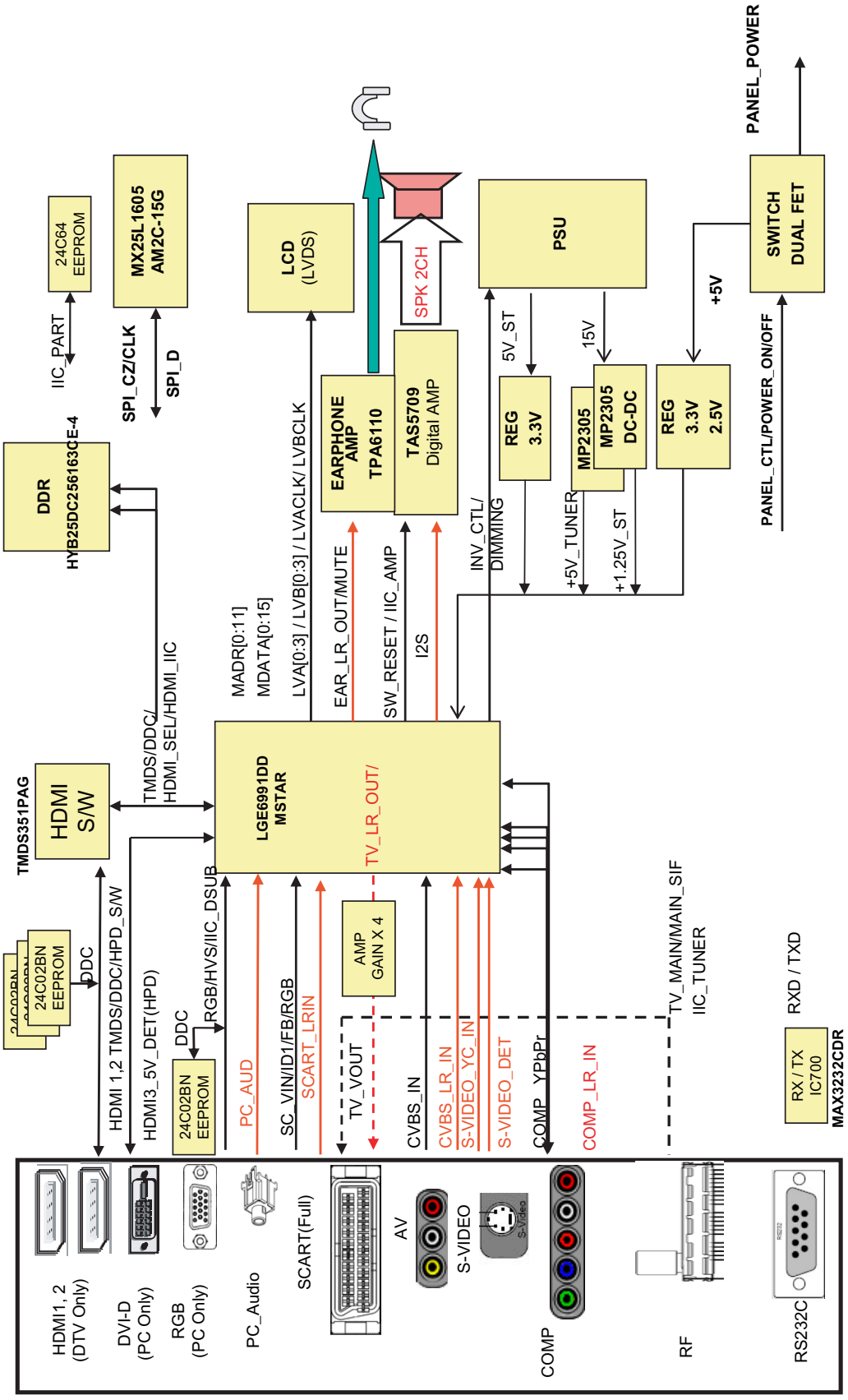
BLOCK DIAGRAM



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DESCRIPTION OF BLOCK DIAGRAM

1.Input Interface.

1-1.PC Input

- RGB Input is directly transmitted to LGE1854C(scaler,Clock 12Mhz) and display up to 1920*1080 resolution
- DVI Signal input go to scaler through TMSD351(DVI/HDMI Switch)
- PC Audio is connected PC-Audio input by Stereo Cable

1-2 Video Input

- Component :YPbPr/YCbCr signal input, Up to 1080P Resolution.
- CVBS/S-Video : CVBS/S-Video signal input, supporting 480P
- HDMI 1,2 :Digital signal input(Included Audio)

1-3 RF(ATSC/NTSC)Input :ATSC/NTSC Input.

1-4 Audio Input :Component L/R,Audio L/R,Stereo(For PC) input.

2.Output Interface

- Video :The video signal goes to LGE1854C(Scaler)-> Frame Memory(210MHz:converted LVDS signal)->Module
- Audio :The audio is divided Digital signal at Scaler go through NTP3000A(Audio Amp IC) and generate to Speaker Head-phone signal is divided to stereo signal at Scaler, then generate Headphone Amp(IC TPA6110)
- Optical Output :Generate audio output from Scaler(SPDIF(Optical)

3.Power Interface

- Input 5V,15V from Power Board is converted to 3.3V,2.6V,1.8V,1.25V,1.2V by Regulator and DC/DC Converter Supply power to Module,Audio Amp and IC

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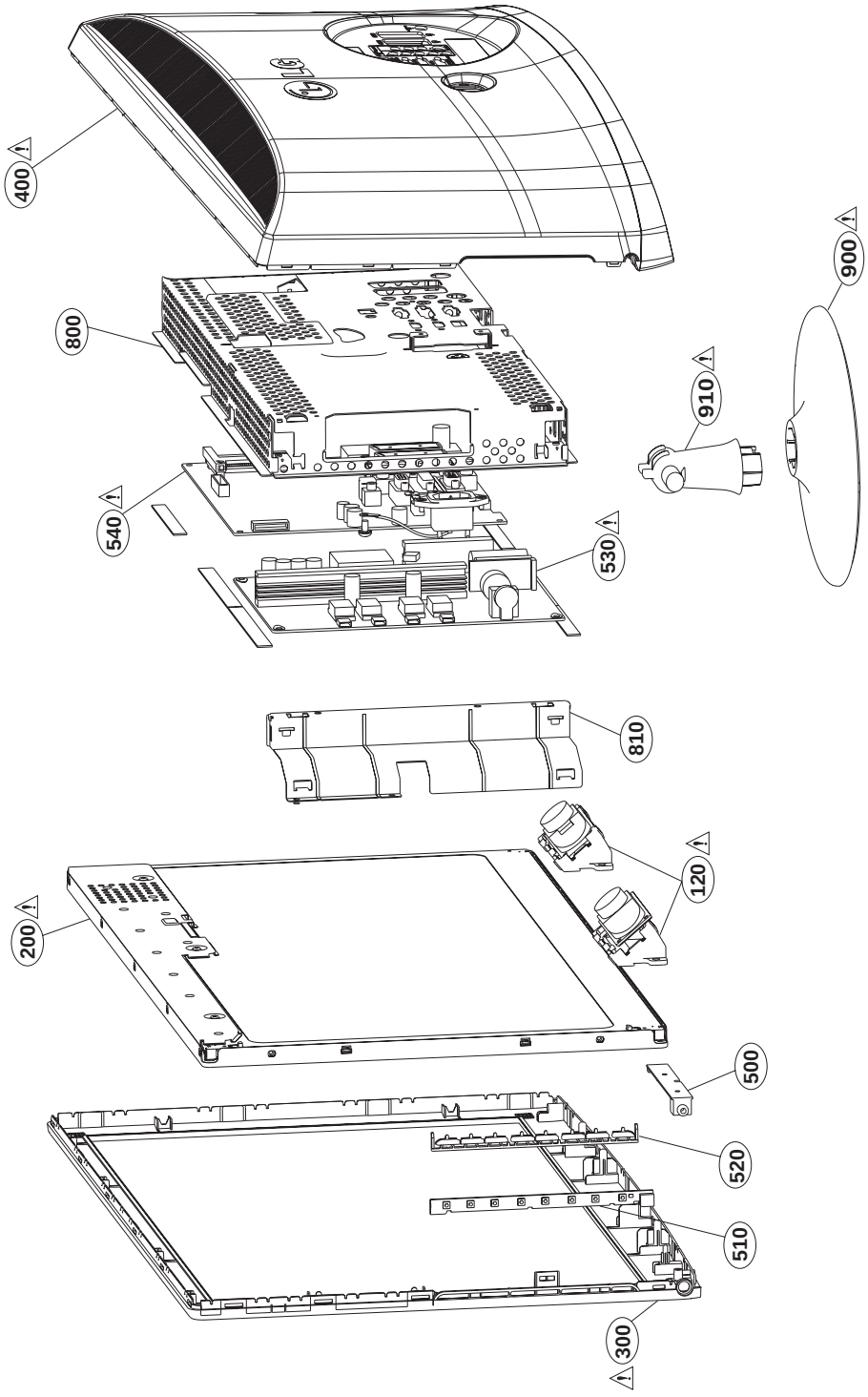
EXPLODED VIEW

IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by ⚠ in the Schematic Diagram and EXPLODED VIEW.
It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent X-RADIATION, Shock, Fire, or other Hazards.
Do not modify the original design without permission of manufacturer.



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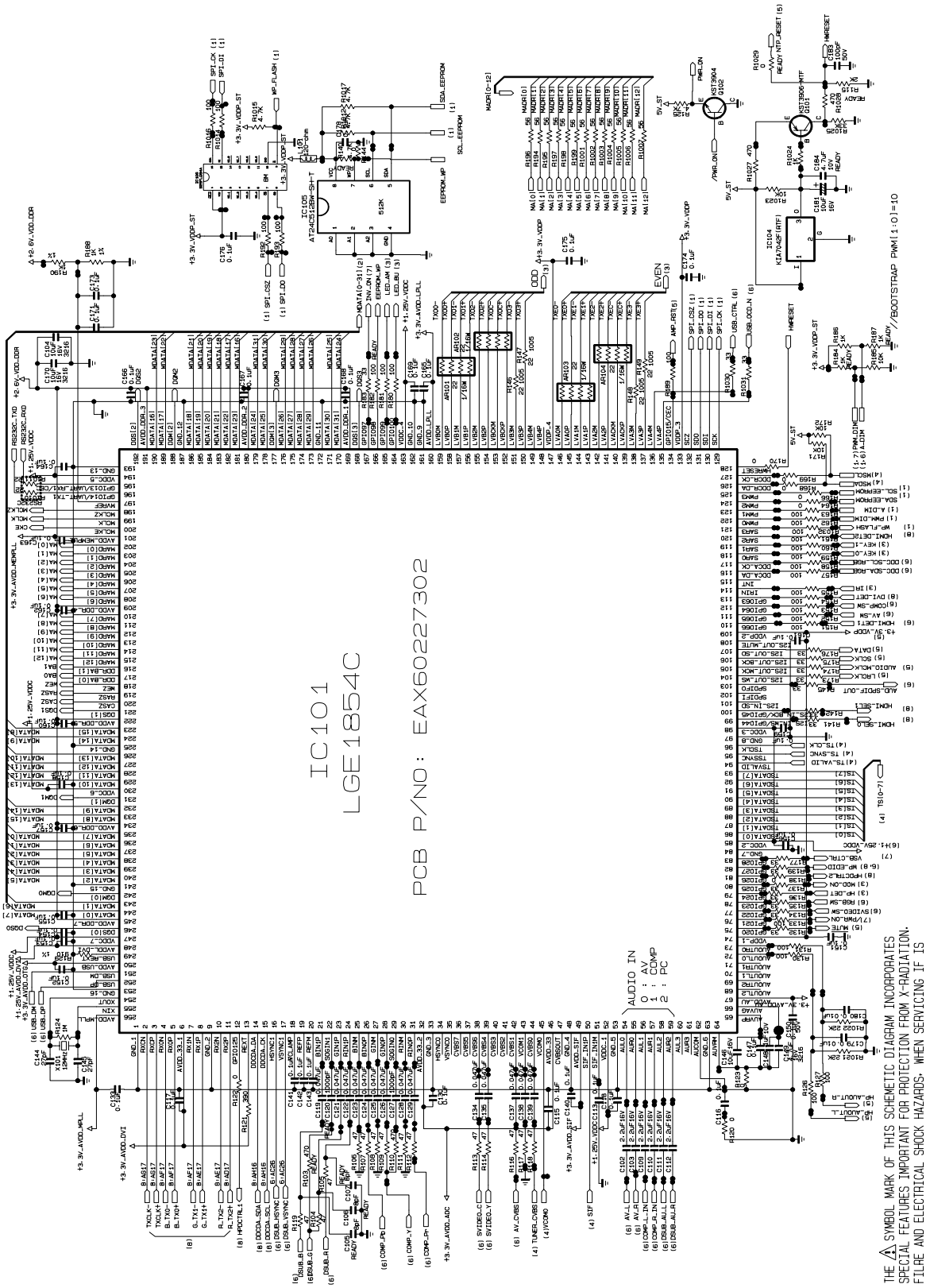
SCHEMATIC DIAGRAM

MAIN


IC101
LGE1854C
PCB P/NO : EAX60227302
AUDIO IN
0 : AV
1 : COMP
2 : PC
THE ⚠ SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES
SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION.
FILRE AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING IF IS
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THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMETIC.

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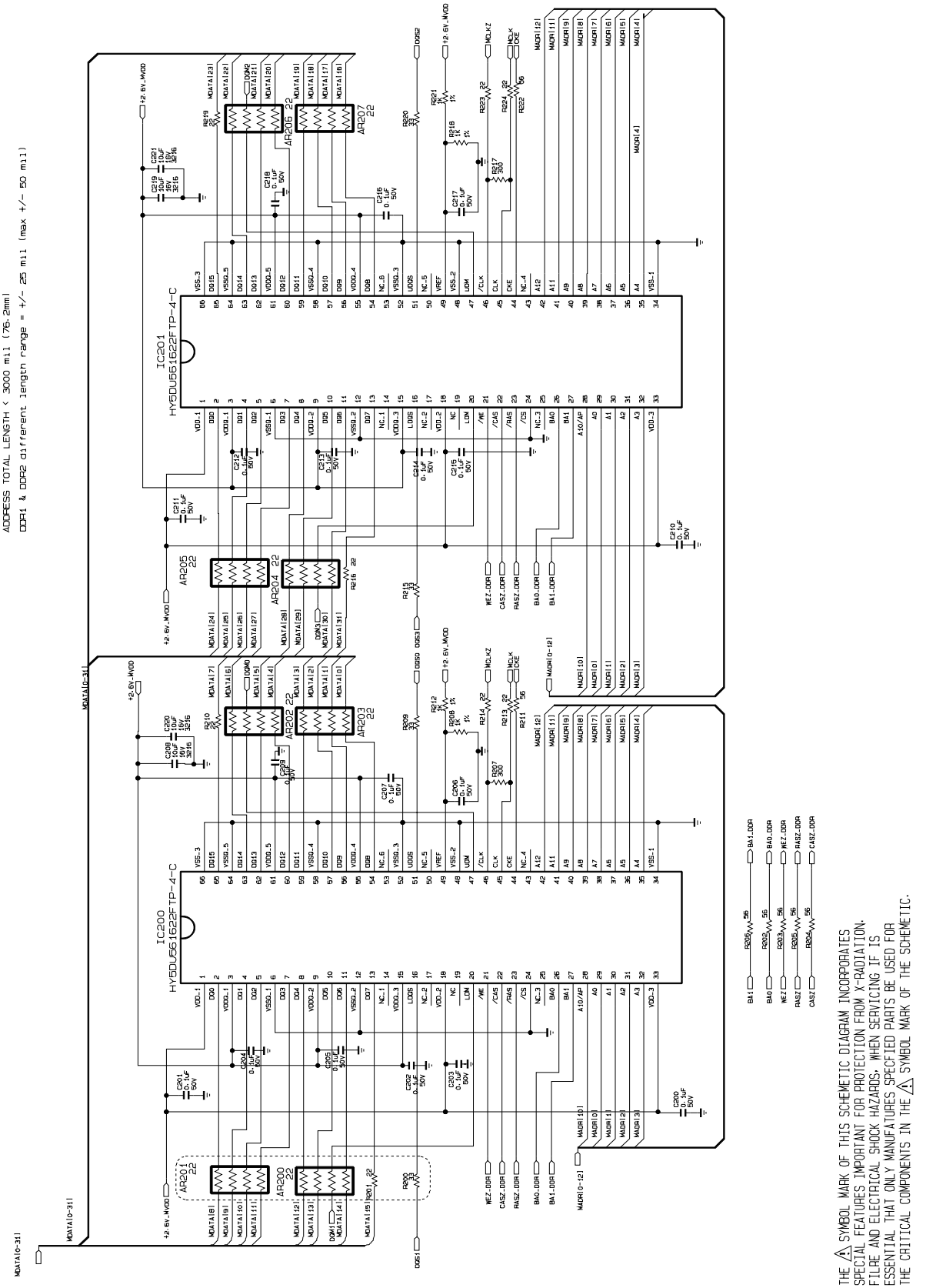
DDR


1 mil = 0.0254 mm
20 mil = 0.508 mm
40 mil = 1.016 mm
ADDRESS TOTAL LENGTH < 3000 mil (76.2mm)
DDR1 & DDR2 different length range = +/- 25 mil (max +/- 50 mil)
IC200
HY5DU56622FTP-4-C
IC201
HY5DU56622FTP-4-C
MDATA[0-31]
MADR[0-12]
BA1
BA0
WE#
RAS#
CAS#
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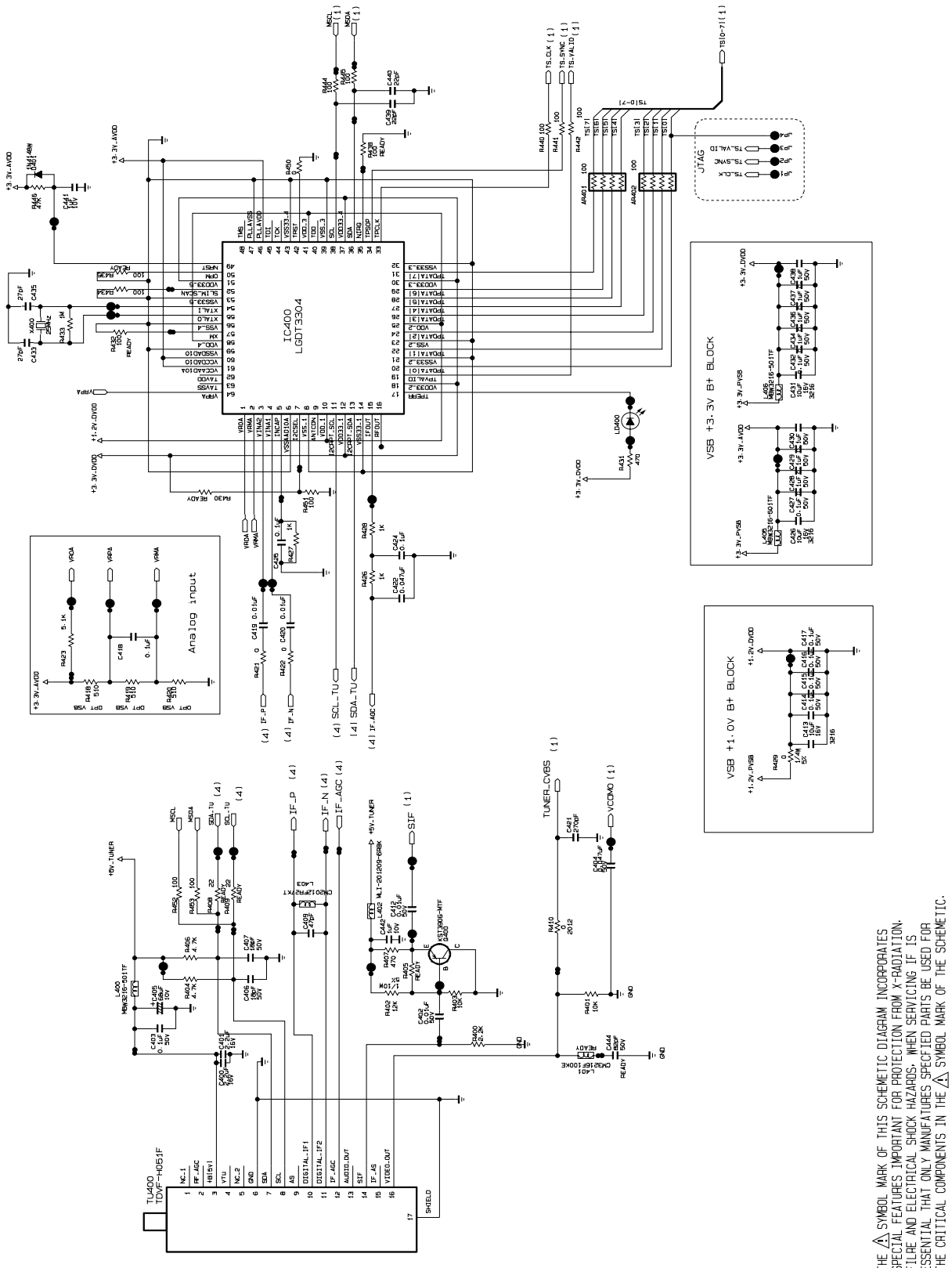
TUNER/ DEMODULELATOR



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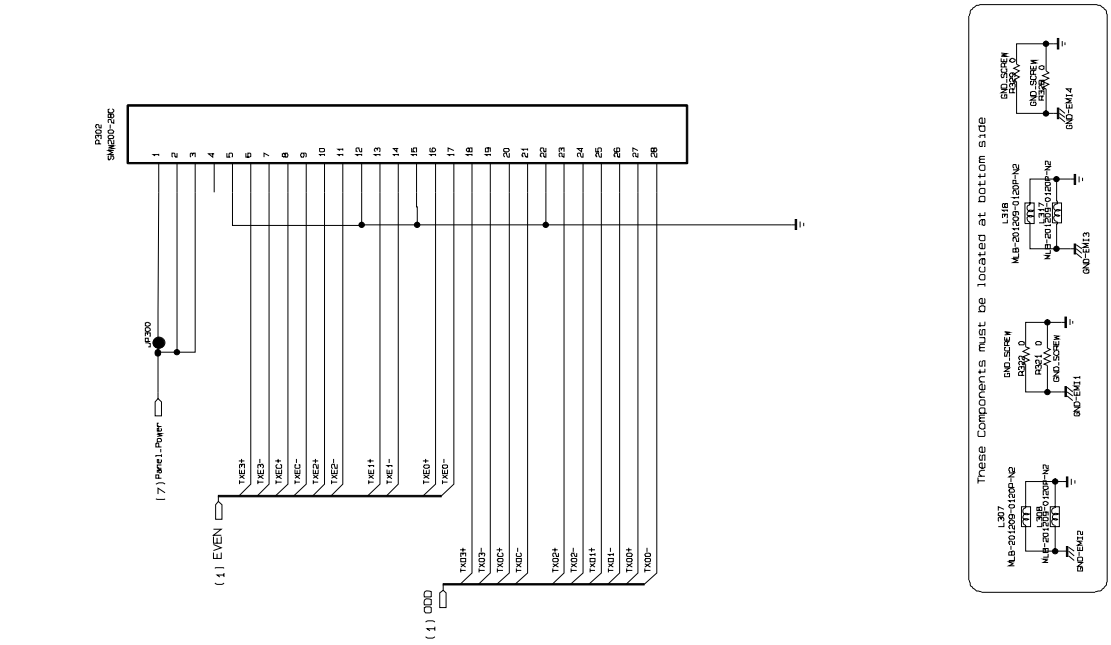
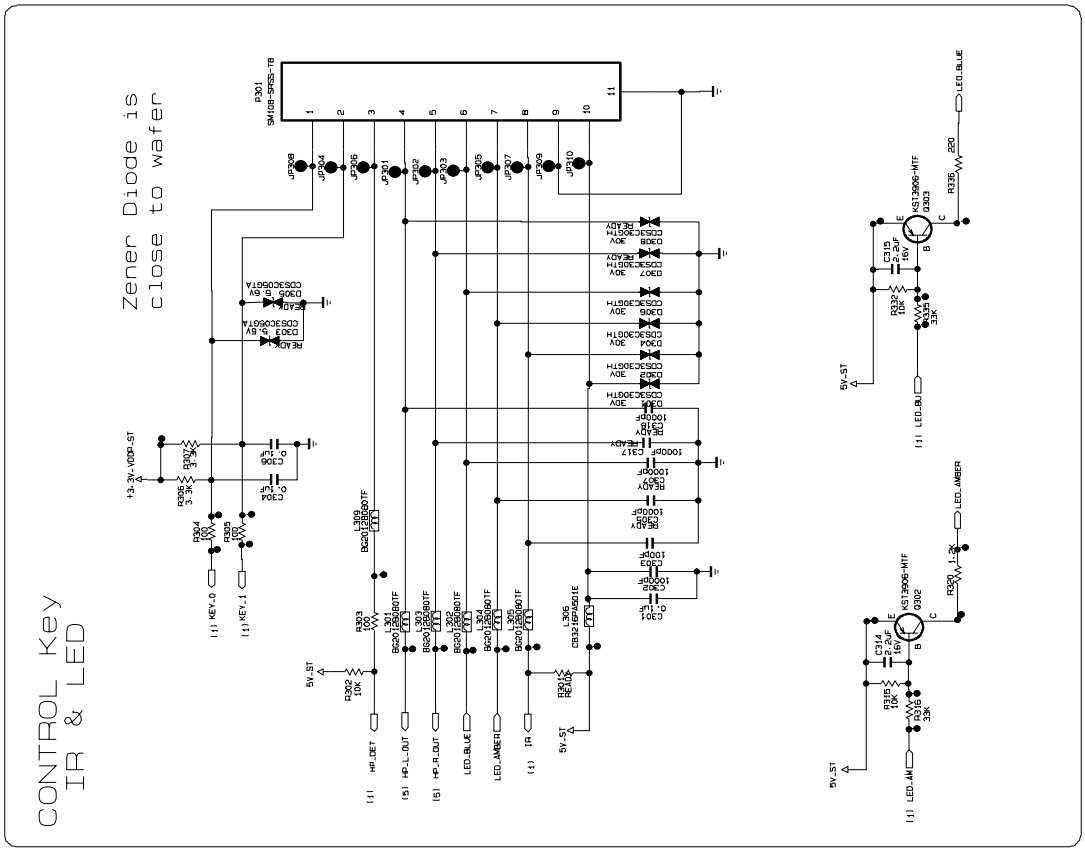
LVDS/ CONTROL





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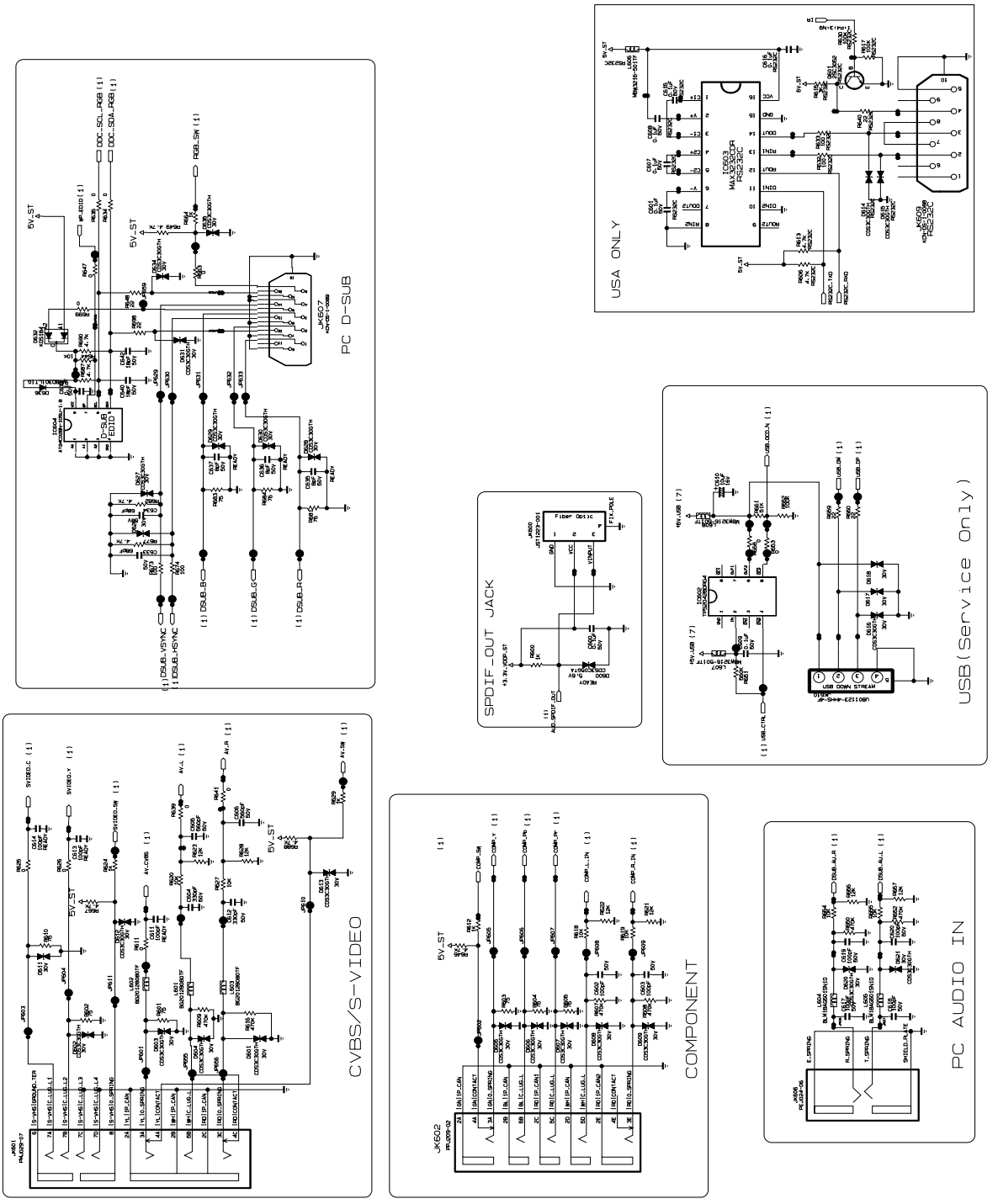
INTERFACE



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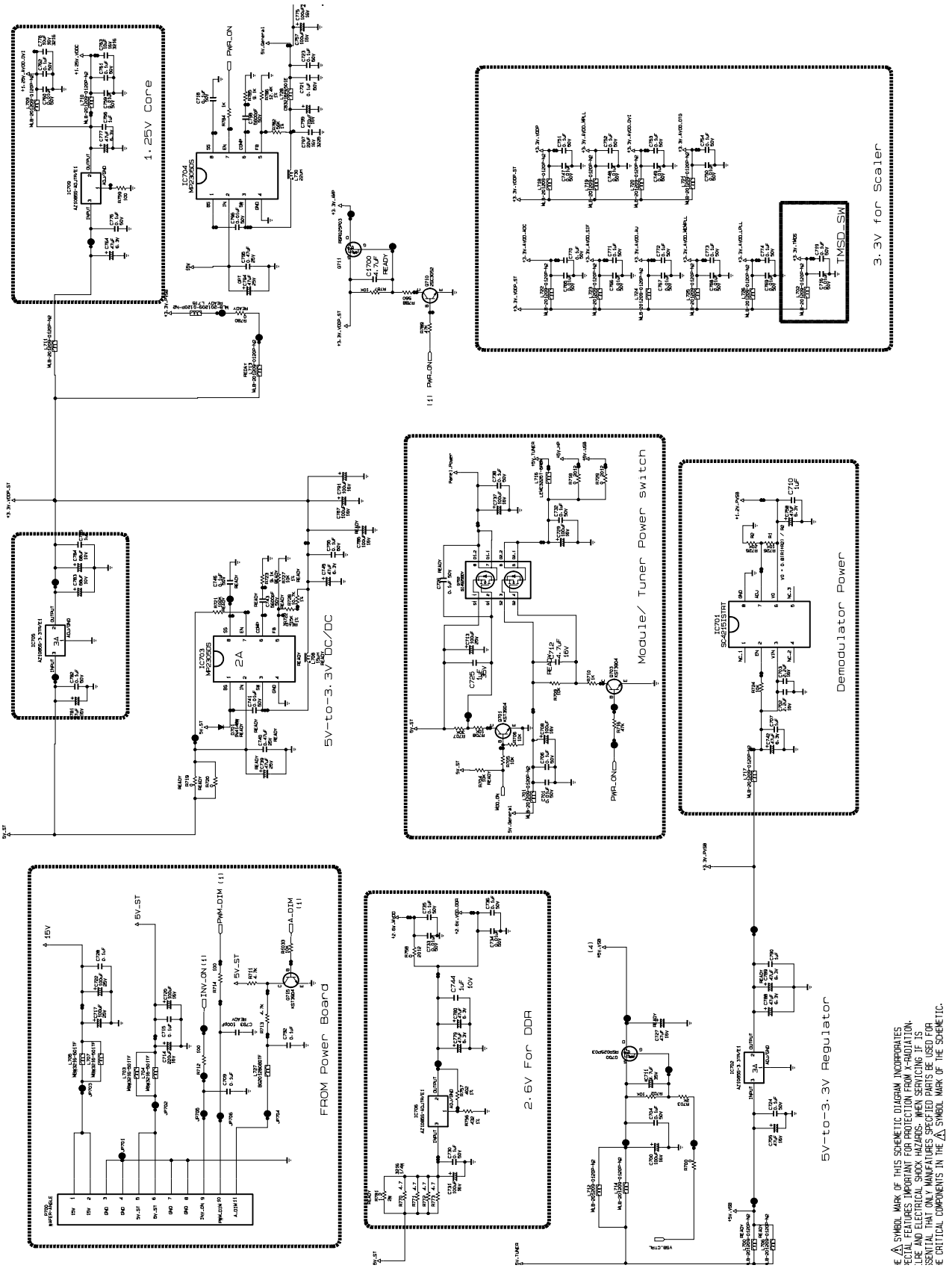
POWER



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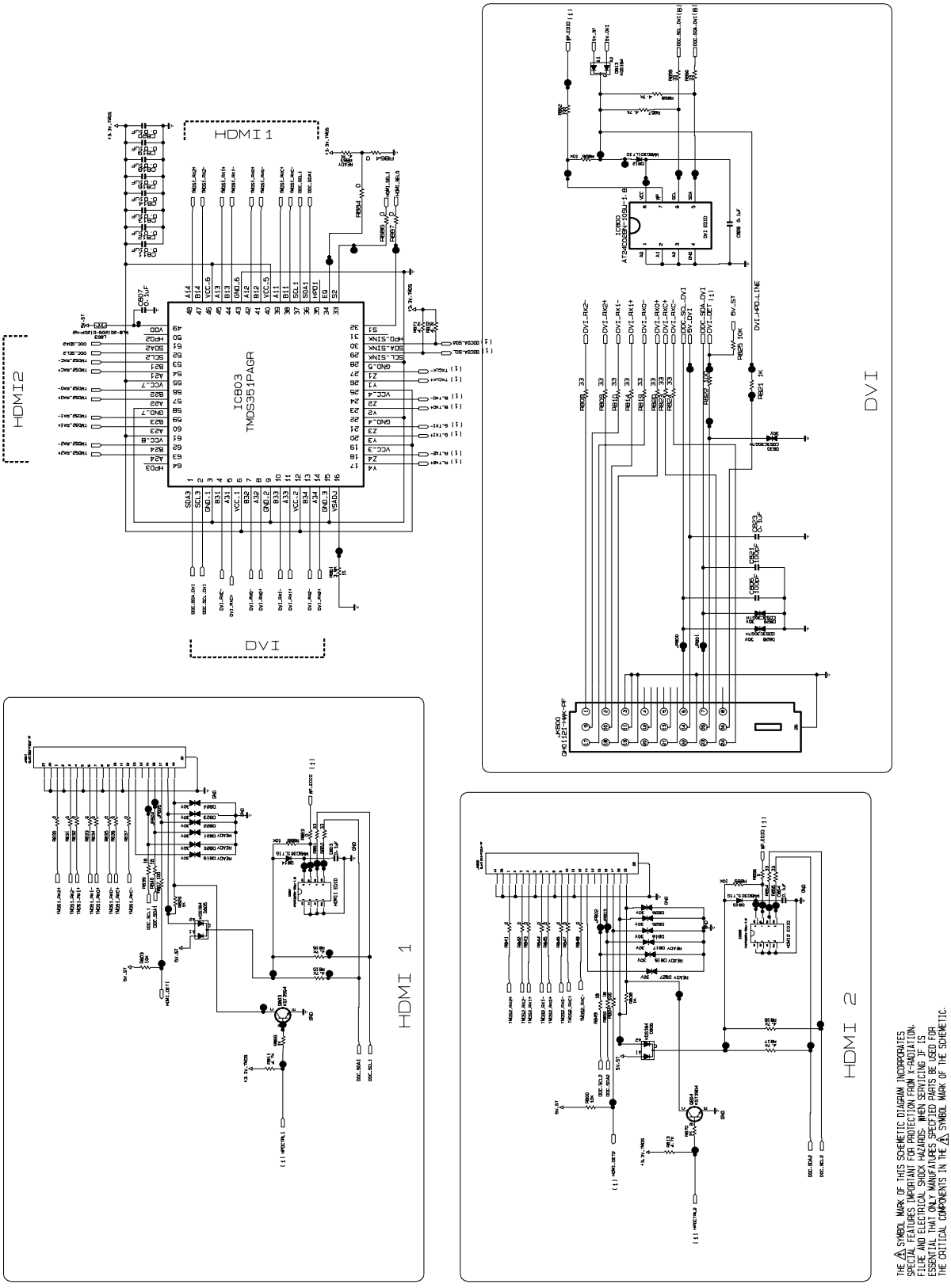
HDMI / DVI


HDMI 1
HDMI2
DVI
ICB03
TMDS351PAGR
DVI
HDMI 1
HDMI 2
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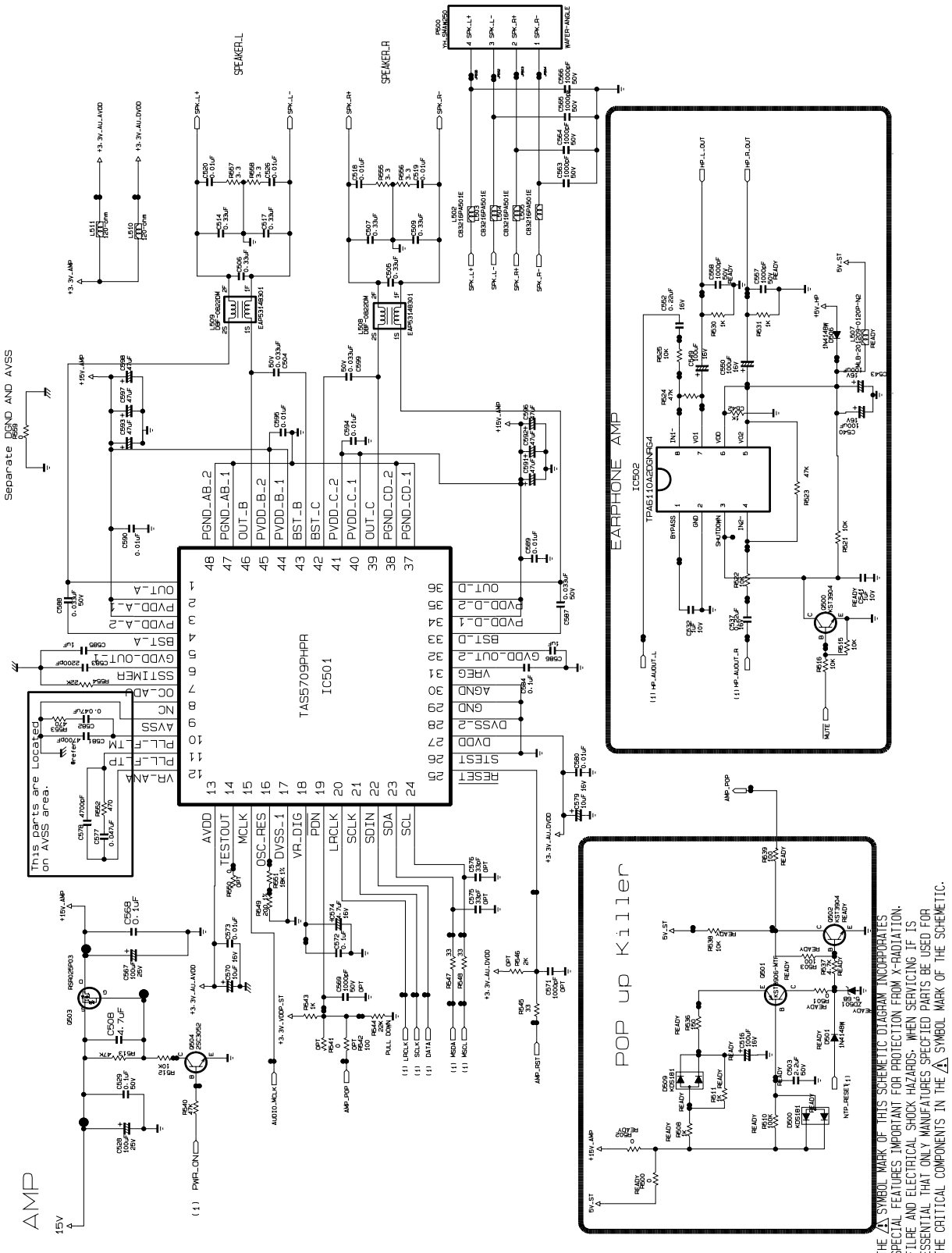
AMP


AMP
Separate DGND and AVSS
This parts are Located on AVSS area.
TAS5709PHPR
IC501
EARPHONE AMP
IC502
TPA6110A2DGNR-G4
POP up Killer
SPEAKER-L
SPEAKER-R
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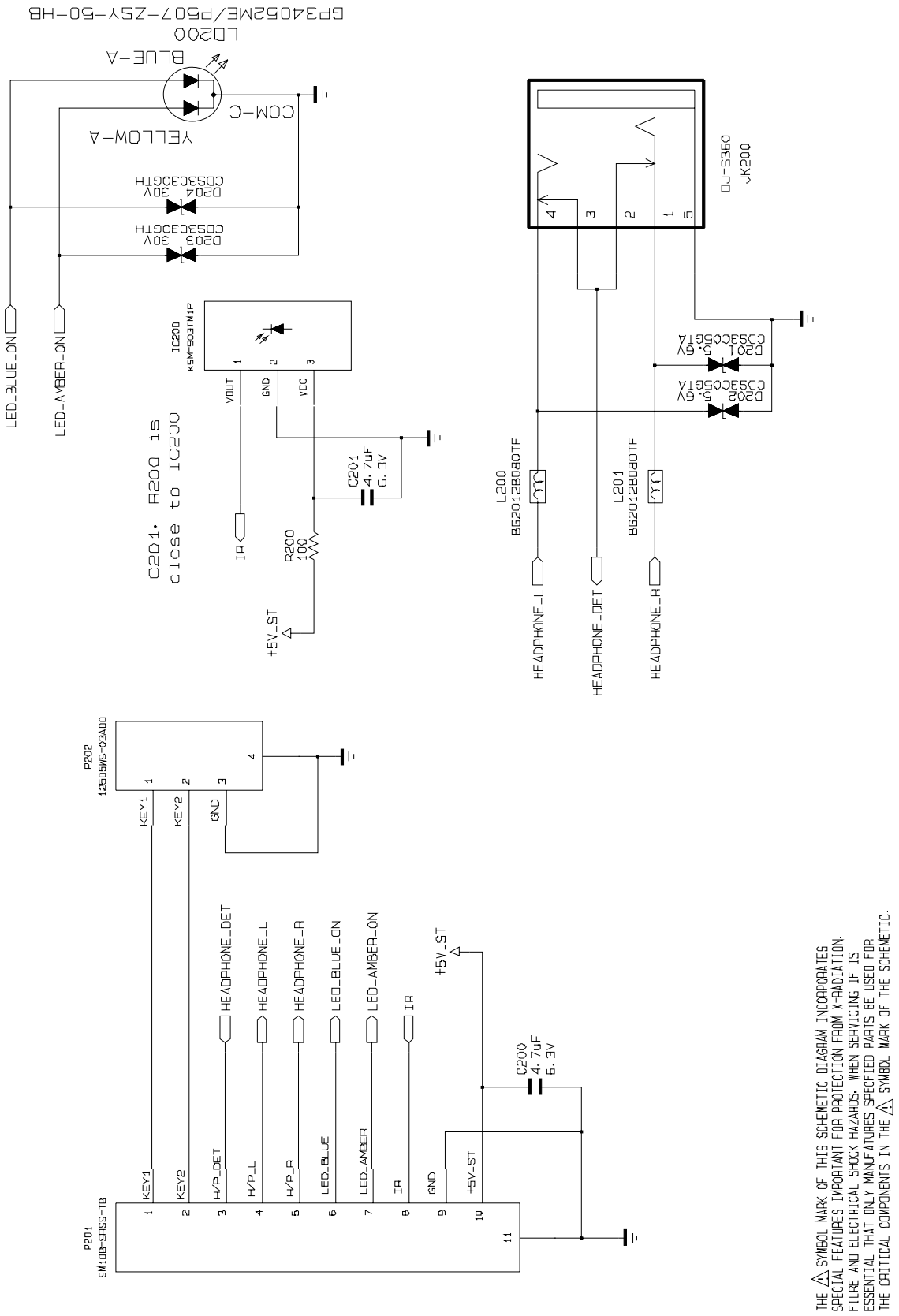
LED_IR_HP



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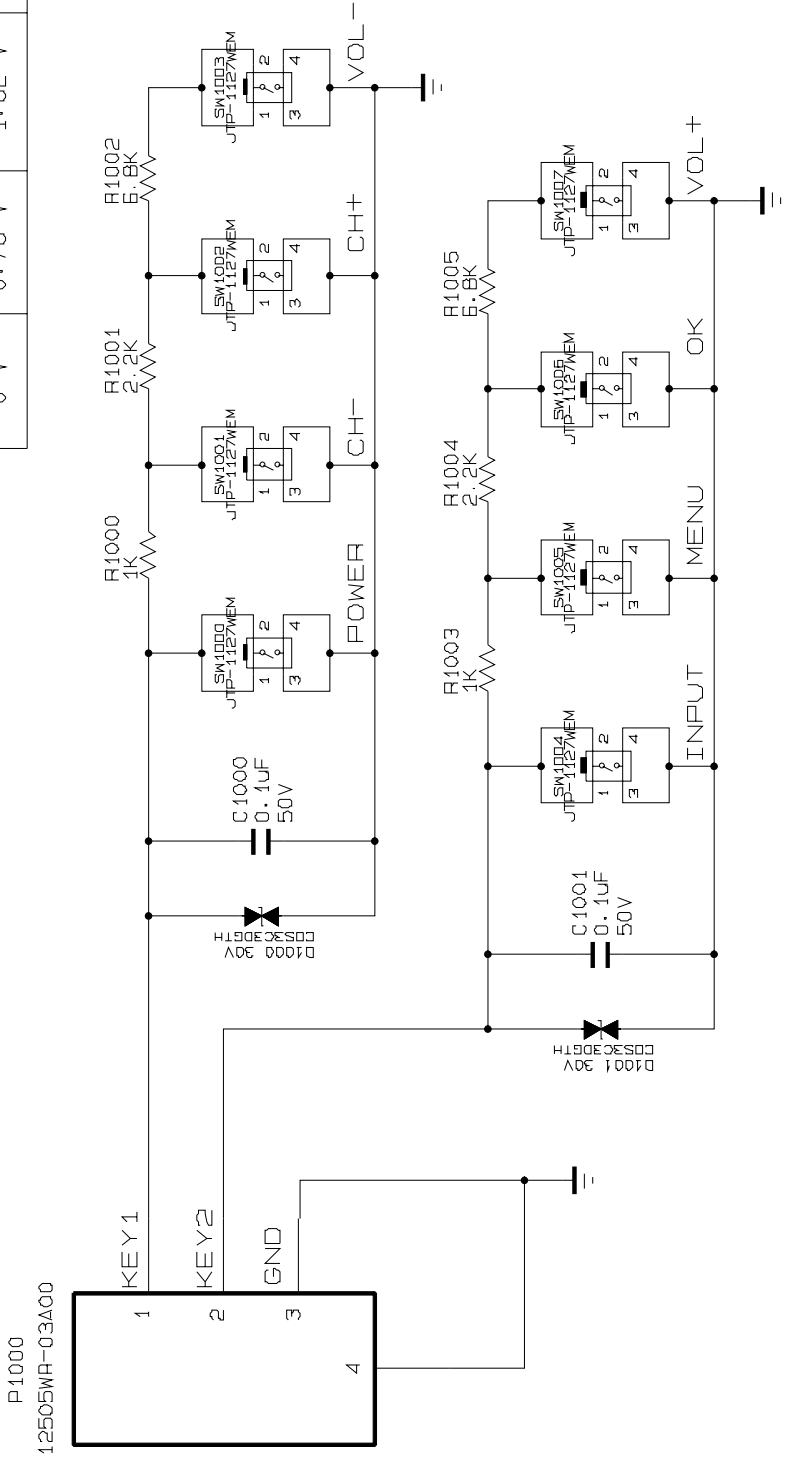
CONTROL KEY

POWER	CH−	CH+	VOL−
0 V	0.76 V	1.62 V	2.48 V
INPUT	MENU	OK	VOL+
0 V	0.76 V	1.62 V	2.48 V



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